Not All Sanctioned by IBM?
Some Users Still Getting Free SE Support

By Phyllis Huggins
CW West Coast Bureau

LOS ANGELES — Some IBM users are still receiving free systems engineering support.

Some of it is provided under contracts "There were some exceptional instances where a contract provided for specific support, which, by its terms, could not be completed by Dec. 31, 1969," an IBM spokesman said "that support will be completed."

But some other users are receiving free, and apparently unauthorized, support which users told CW is called "system support."

Asked if IBM currently offers any form of systems consulting at no charge to users with installed systems, an IBM spokesman told CW

"No. IBM does not offer free support such as systems design, programming, or systems consulting. We know of no instances of separately priced services being offered free of charge. That would clearly be a violation of IBM's policies. If we knew about such instances, we would put an immediate stop to it"

The situation is confused by the fact that marketing representatives at no charge, "can determine if equipment to meet a customer requirement to solve existing problems, formulate general systems solutions to problems, develop applications and configuration approaches."

They can also "provide technical information to customers," according to the IBM spokesman.

Some marketing representatives are former system engineers, he said

Although IBM denied knowledge of the "system sales support" services, one user who lost his free system engineers when the unbundling announcement took effect said, "We get a lot of it free"

Another user says, "One systems support man works here full-time and others come in when they're needed." This user, who is currently converting from Cobol F to Ansi Cobol, told CW, "I don't know whether IBM would want this publicized, we have no SE's any more but we are receiving increased system sales support." The user added that during the Cobol conversion one full-time free IBM representative has been made available and others are provided as needed He told CW that no system software (Class A) problems were involved and classified the operation as just conversion work

The Cobol user did not even ask IBM for the system support. "IBM knew we were converting, knew we were having problems, and offered to help us out," he said

One data center head told CW that his IBM marketing representative had recently visited his installation with two associates. The two were introduced as having SE background and the
(Continued to Page 4)

Tardy Automation Delays Support Checks for Estranged N.J. Wives

By Edward J. Bride
CW Staff Writer

NEW BRUNSWICK, N.J. — More than a thousand New Jersey women recently spent up to one month waiting for $300,000 in overdue support checks from their estranged husbands because of a "communications breakdown" between county probation and data processing officers.

The probation department in the New Jersey's Middlesex County, as in other counties here, acts as a clearing house for support checks, but the "communication gap" resulted in the county computer department's not being prepared to automate the procedure scheduled

The breakdown is not difficult to identify

Former Middlesex County Systems, Procedures, and Data Processing chief Ned Mangarella now holding the same position in nearby Union County says the Probation Department did not want a parallel run when the computerized system was due to begin in January.

Probation Officer Joseph Bonomo says he did

Mangarella has just started his job in Union County, and one of his chief duties will be to establish the same computerized clearing procedures he finally accomplished in Middlesex County. He says his leaving the old post is not directly related to the problem

Not a Simple Problem

The program calls for estranged husbands to make their checks payable to the county's Probation Department, which records the payment, checks arrearages, and in turn deposits the checks and makes new ones payable to the wives.

The fact that the probation department really did want a parallel run is only a small part of the problem.

Mangarella reports that a "mix-up in priorities" resulted in the program's not being ready the first week in January.

Actually, the system was supposed to be operational in September, but Mangarella says that the probation department never fed him any data until November.
(Continued to Page 4)

Honeywell's Series 15 control panel and console are within easy reach of operator, shown reading printout of problems entered earlier through console.

Honeywell Series 15 Competes With 1130

By Frank Piasta
CW Staff Writer

WELLESLEY HILLS, Mass. — Honeywell's EDP Division last week announced a new family of computers, consisting of its first small scientific system and a communications-oriented processor, developed from the 316 minicomputer offered by Honeywell's Computer Control Division

The Series 15 consists of the 1530, intended by Honeywell to compete with the IBM 1130, and the 1540 which is said by Honeywell to expand the communications capabilities for users of that company's Series 200 systems.

Characteristics of both processors include a magnetic core memory expandable to 16K 16-bit words in 4K increments, memory cycle time of 1.6 usec, priority and power-failure interrupt, single addressing, integrated circuitry, and a repertoire of 72 instructions

The following features are standard on the 1530, optional on the 1540 hardware multiply/divide, double precision add and subtract, and integrated peripheral controls

A new operating system was also introduced. OS/15 is a diskresident system that features an 1130-compatible Fortran IV compiler, and assembler, a library of scientific and commercial subroutines and an RPG

1530 Details

The 1530 is equipped with a minimum memory size of 8K words with memory parity checking as standard The data transfer rate is 156K word/sec through the standard multiplexer channel Typical executive times furnished by Honeywell are: 3.2 usec for add or subtract, 8.8 usec for multiply, and 17.6 usec for divide

A typical 1530 configuration, according to Honeywell, would consist of an 8K central processor, console, 300 line/min printer, card reader-punch (400 card/min, read, 100-400 card/min, punch), and 720K words of disk storage the price, on a one-year lease, would be $2,076/month.
(Continued to Page 4)

Midwest Compso Show Draws Regional Users

By Drake Lundell
CW New York Bureau

CHICAGO — The traveling Compso road-show played to smaller crowds here last week than during its debut in New York City last month, but appears headed for a grand finale in Los Angeles in April

The sparse Chicago crowds, estimated at between 4,000 and 6,000, surprised many people, who pointed out that this is the only computer related exhibition to be held here. But, as in New York, the quality of the crowds was high and the show appeared dominated by users.

User reaction to the Chicago show followed the pattern set in New York, where more than 7,500 turned out for the first exhibit dedicated to computer software and peripherals. Visitors were generally pleased with the show

Most users said that the show gave them a chance to talk with the various suppliers without the distractions of a joint computer conference, and it appears from the crowd reaction, that more business gets done in the Compso atmosphere than at the joints for the individual attendee.

The midwest exhibit drew users from a wider geographic distribution of installations than the N.Y. show. This was given as one of the reasons for the relatively light attendence at the midwest show

The show was successful in the eyes of its organizers, the Show World Inc., a division of Computer-Expositions Inc., and they plan to hold next year's Compso-Midwest Show in Mc-
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Computer Matching Attacked in California

By Phyllis Huggins
CW West Coast Bureau

LOS ANGELES — "We are interested because of the tremendous faith people have in computers. They think that if a computer does it, it must be all right," said Andrea S. Ordin, deputy attorney general of the State of California Department of Justice.

An attack against computer matching was opened here on Feb. 11 with the filing of a complaint to be heard on Feb. 25. The charge was made against the Matchmakers dating bureau. This marks the first legal action taken by the state against the growing practice of advertising the use of computers to find com-

patible members of the opposite sex. According to Miss Ordin, this could turn into a full-scale investigation of all such firms operating in the state.

"We may look into legislative action such as requiring licensing or we may just take court action against violators."

The principal complaint of concern to this industry is that computers are not used, they are just advertised as a computer — while names are actually selected at random.

Other complaints are that there are no fixed fees, that charges are whatever the client will pay. Prices range from $10 to $20 just to get one's name on the list to more than $1,000. Further,

little or no psychological tests are used, the counselors are instead salesmen, and although fees are charged for investigation of the client, no investigation is undertaken.

In addition, many clients do not receive referrals so get nothing for their money.

Computerworld talked to one client of Matchmakers, a pretty grammar school teacher in her early thirties, who paid $250, $125 of which was for "investigation." She said, "How much investigating do you have to do of a grammar school teacher?"

She received two referrals over a 10-month period, neither of which matched her requirements. Although she is Catholic, the first was ex-Catholic with completely opposite traits and interests. They had one miserable date.

The second was a "gun-happy, alcoholic fascist" who scared her half to death. When she had a policeman friend look him up, she found that he had four drunken driving arrests.

On the other side of the coin, Computerworld talked to a woman of 47, with means, who paid Intramatics (a company which went out of business last month when the district attorney's office brought criminal action against it for selling stock without a permit) and met five charming men. She is happily married to one, and two others are still friends.

One man who had joined Matchmakers said that he finally had to turn it off.

When asked if the dates seemed to have been matched, he said, "Definitely not. Some of them were awful. Out of the whole lot I still have contact with only one of them."

On questioning people who have looked into different firms, Computerworld was told that some of them, instead of using the advertised "computers," have card sorters and select on the basis of only three points — age, education, and religion.

One firm, Compatability Testing of Los Angeles, is a member

of a national firm which also operates in Canada and does indeed use computers.

The manager of the local office said, "We have to use computers. It's the only way you could match the large number of traits we use.

When asked to comment on the attorney general's suit, he said, "If they want to investigate I hope they do it fast and right. We've carried these slinky firms on our shoulders for years. We have very good rapport with the Better Business Bureau, thank God!" When asked if his firm investigated clients he said, "If you don't investigate you're asking for someone to shoot you."

Computer matching, whether with computers or not, has an impressive record of happy people as well as bitter customers. With no trouble at all you can find people who signed up for a $15 service and ended up marrying their first date.

At a recent Las Vegas holiday event, one company ran into a problem. Despite having all available key punchers work an all-night shift, it was unable to complete the preparation of data of all those attending.

Instead of finding a list of "matches" in their hotel box in the morning as promised, they had to cool their heels impatiently as they waited for the vital computer report.

The resulting publicity from the California case should not hurt the image of the computer as at the present time there is no attempt being made to invalidate the method of selection used by those firms that do employ computers.

Instead, the attempt is to get those that are trading falsely on the mystique. This illustrates the unquestioning faith that people have in computers.

Of the eight firms currently operating in Los Angeles, the attorney general's office said that as many as six of them may be cited.

This may well trigger action by other states.

World Systems Competes For IBM's SE Contracts

WASHINGTON, D.C. — Users displeased with the terms of IBM's unbundling announcement now have a competitive option to choose.

World Systems Laboratories, Inc., a Bethesda, Md.-based data processing firm, has announced a competitive systems engineering contract that can be used in lieu of obtaining such services from hardware manufacturers.

World Systems says its plan differs from the standard IBM contract in that:

• Personnel are selected by both the customer and the company.

• SE continuity is assured.

• Procedure for requesting services is simplified.

• The company honors the customer's preferences in data and confidential information.

• The term of the agreement is "at the option of the customer."

• "Fixed price" contracts are possible within the framework of the agreement.

• Charges are less than those offered by equipment manufacturers for "comparable levels" of service (the company said that "about 20%" of its SEs are ex-IBM people).

• Three schedules of rates are provided. Hourly costs decrease according to the number of hours guaranteed.

• Should the customer elect to utilize additional systems engineering services during the course of the contract, he may obtain a lower hourly rate retro-

actively.

Charles H. Dym, president of World Systems, claimed that his company's SE group would "fill the 'unbundling' needs of the full range of computer users.

"This plan will give the data processing manager a responsive and economic option to those contracts offered by some hardware manufacturers," Dym said.

Under the new plan, World Systems offers three basic schedules of services rates. The schedules, based on customer usage, generally are 20% to 25% below those the data processing manager would be expected to reimburse the hardware manufacturer.

The SE services will initally be offered in a few selected geographical areas including Washington, D.C.; Baltimore and Hagerstown, Md.; and Pittsburgh and Philadelphia. World Systems is a subsidiary of the Pennsylvania Engineering Group of Companies.

The company complements its associated corporations by bringing a broad range of system analysis and computer technology capabilities to the area of scientific and industrial control.

Keypunch Goofs: Cars Are Unregistered

JEFFERSON CITY, Mo. — An error in keypunching has caused a delay in the receipt of auto registration renewal notices by thousands of Missouri drivers in January — costing them $2.

The notices usually are sent out early in the month, according to Harry Smith, supervisor of

Missouri motor vehicle registration. When a notice fails to arrive by the middle of the renewal month, there is a good chance it won't arrive in time for the driver to avoid paying the $2 penalty — unless he acts on his own.

There is no legal requirement

that such notices be sent out, although the practice has been traditional, Smith said.

A random block of cards, according to August Marsch, director of data processing at the Jefferson City motor vehicle headquarters, was inadvertently misplaced by keypunched operators, causing the delay. A approximately 10,000 notices were misplaced out of the almost 2.5 million processed, Smith said. The Registry employs an RCA Spectra 70/45, installed in 1967, to expedite document processing.

Marsch estimates that a high percentage of the expired registrations have since been replaced with new registrations, but adds that about 10% of the affected drivers are still driving with expired documents.

To correct the problem, a more thorough control of the records is being implemented, with each department accounting for card movement through its own area, Smith said.

ACLU Attacks Army's Civilian Disturbance Data Bank

By Joseph Hanlon
CW Staff Writer

WASHINGTON, D.C. – The Army's computerized data bank on lawful civilian political activity has come under renewed attack.

The American Civil Liberties Union (ACLU) last week filed suit against the data bank. And Rep. Cornelius Gallagher (D-N.J.) announced that his Right to Privacy Inquiry would hold hearings this week on the data bank.

The computerized file of Civil Disturbance Incident Reports contains information on lawful, nonviolent meetings and lectures, and includes groups such as labor unions and the ACLU.

The ACLU charges that the Army Intelligence Command is building up dossiers "through the Army spy system, by anonymous informants of the FBI and local and state police, and through the use of photographic and electronic equipment."

They also charge that these dossiers are widely and indiscriminately disseminated through a Teletype network to every troop command. Copies of military Teletype reports for March 13, 14, and 18, 1968 are attached to the ACLU complaint as evidence.

The ACLU is acting on behalf of more than a dozen plaintiffs, many of them named in the three Teletype reports, and the others with reason to believe that they are included in the data bank. Among the plaintiffs are several anti-war groups including the Vietnam Moratorium Committee and Clergy and Laymen Concerned About the War in Vietnam.

One of the plaintiffs is a labor union: Local 1733 (Memphis, Tenn.) of the American Federation of State, County, and Municipal Employees. This union was involved in a garbage collectors strike in 1968.

The ACLU seeks an injunction to permit the plaintiffs to engage "in peaceful political protests," "church meetings," etc. without "surveillance, by Army agents and without becoming subjects of dossiers, reports, and files in the Army's data bank."

The suit has been filed against Defense Secretary Melvin Laird, Army Secretary Stanley Resor, Chief of Staff Gen. William Westmoreland, and Brigadier Gen. Blakefield of the Army Intelligence Command, and was filed in the U.S. District Court for the District of Columbia.

Although the ACLU is one of the groups included in the Army data bank, it is not a plaintiff in its own suit.

The Army has released some information on the operation of the Civil Disturbance Incident Report data bank

"Incident reports", which can include lawful, non-violent, and seemingly, innocuous meetings and lectures, are put onto punced cards and then transferred to tape. The data bank uses an IBM 1401.

"Incident reports" come primarily from newspaper articles and from reports by the FBI and local and state police. Apparently no attempt is made to verify information before or after it is filed.

Some Users Get Free SE Support

(Continued from Page 1)
group offered their help on two specific operating jobs. One of these was 'a hospital application and the other was an Administration Terminal System (ATS) application.

Since both applications were already 'installed and operating, the data center manager thanked the IBM representative for the IBM that declined that assistance, declined the assistance.

In both the applications site and the Cobol conversion operation, free assistance was volunteered by local IBM representatives.

IBM has always been willing to offer system design support when equipment is being selected by a prospective customer. However, sales support offered to users with installed equipment, apparently would of-

fer a departure from previous IBM policies.

Although IBM spokesman were unable to identify the term "system sales support," several users told CW that this term had been used for some time, perhaps unofficially, by IBM local

representatives to identify sales support given to users considering the purchase of IBM equipment.

Before unbundling, sales support typically involved both salesmen and SEs working with the customer to achieve the best possible configuration to meet user's needs.

One user told CW, "After unbundling, systems engineers were transferred to marketing support staffs." Presumably, in the unbundled environment, this group

would work outside customer's offices to assist salesmen in preparing proposals and systems plans.

In one particular case, a user told CW that he had several IBM industry specialists at his installation on a full-time basis before

Text of IBM Statement

Question by Computerworld:	Does IBM currently offer sales support in the form of personnel performing functions such as systems analysis, systems design, programming, or systems consulting at no charge to customers with installed equipment?
IBM Answer:	"No, IBM does not offer free support such as systems design, programming, or systems consulting. We know of no instances of separately priced services being offered free of charge. That would clearly be a violation of IBM's policies. If we knew about such instances, we would put an immediate stop to it."
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unbundling. Two of these specialists had PhD's and one had an MS. With unbundling, these specialists were transferred from the SE staff to marketing positions and they continued to offer the same type of consulting and application systems design as they had before.

One user, who told CW that he had obtained extra support by complaining to his local IBM representative,' said, "Anyone who yells loud enough can probably get extra support."

Honeywell Mini Vies With 1130

(Continued from Page 1)
on a five-year lease, $1841/month; and may be purchased for $83,780. Monthly maintenance charges on purchased system would be $510/month.

A similar configuration of the IBM Model 1130 Model 2 would rent for $2250/month, the Model 3 for $2580/month. The Model 2 has a memory cycle time of 3.6 usec, and the Model 3 is rated at 2.2 usec, contrasting 'with the 1.6 usec of the 1530/1540.

The random access storage available with the Series 15 also seems superior to the IBM 2310 which has a much slower average access time, 520 msec, than the Honeywell unit at 100 msec.

IBM does have an advantage in that the 1130 offers up to 32K of core storage, twice that of the Series 15. The Series 15 also lags behind the 1130 in availability of peripheral devices. Such 1130 devices as paper-tape devices,

plotters and optical page readers are not 'offered with the Series 15.

The 1540, according to Honeywell, was developed for two primary purposes, as a remote data concentrator and as a remote batch terminal for use with the Series 200 computers.

As a data concentrator, the 1540 would include a central processor, a single-channel communication control and a basic multi-channel communication control that accepts up to 32 low-speed lines.

The single-channel control has options to allow either synchronous or asynchronous transmission operation over private or switched networks, and transmission of 6-, 7-, or 8-level codes. It also provides an interface with standard Bell system or equivalent data sets for synchronous transmission speeds of 2,000 to 50,000 bit/sec.

The 1540 is available with a

variety of peripherals that include disk drives, card equipment, line printer, and either 7- or 9-channel tape drives.

A typical 1540 configuration would include, according to Honeywell, a 4K central processor, a console, a 300 line/min printer, punched card equipment (400 card/min, read, 100-400 card/min, punch, and a communications interface. The price on a one-year lease would be $1,744/month, while a five-year lease would cost $1,671/month. Purchase price has been set at $74,970.

Deliveries of both systems will begin in July, on a 30- to 60-day schedule.

Midwest Compso Draws Regional Users

(Continued from Page 1)
Cormick Place, which is a larger exhibit hall here than the Palmer House, site of the exposition this year.

Many of the regional firms exhibiting at the midwest show for the first time told CW that they were pleased with the quality of the crowds even though they felt they were lighter than expected. A few were enthusiastic from the start of the show, while others indicated that they would wait and see how much business developed from the conclave before they passed judgement.

Some of the firms that were at the New York Show were glad to be back for the second round of Compso. Reportedly Talcott Computer Leasing Corp. did almost as much business the first day in Chicago as in the full three days in New York.

While the Chicago crowd was lighter than the New York attendence, it appears that the Compso-West show in Los Angeles this

April will be the largest of the three planned shows, Compso organizers said.

At present, r Compso spokesman said, more than 150 booths have been sold at the western show and more are expected to sign up in the near future. The crowds are expected to be larger than either New York and Chicago, he said.

From the second show it ap-

pears that the Compso shows are fulfilling their purpose-- They appear to be drawing both regional exhibitors and attendees, even though attendence has been below expectations. Most of the Chicago exhibitors and attendees felt that the show would be bigger and better next year as the word spreads among the midwestern computer community.

Tardy DP Delays Support Checks

(Continued from Page 1)
So, when the programmer finally finished, the data processing department was informed that the probation department would not allow any erroneous checks to be sent out.

Some of the checks had mistakes, so probation officer Bonomo, alleges Mangerella, had the checks stopped.

Enter 1,200 angry wives.

To complicate the matter, says a local newspaper, Bonomo believed the system would be

ready, intact and debugged,' for the first January checks, so he didn't order any blank checks, ledger books, or other support papers. One source estimated that in so doing, he saved the county a maximum of a couple hundred dollars.

Checks are now being sent out regularly, but Middlesex County is looking for a new head of the department of systems, procedures, and data processing, and the wives are still grumbling about the computer.

Columbia Hospital Returns to Hand-Posting Its Bills

By Edward J. Bride
and
Peter F. Carr
CW Staff Writers

COLUMBIA, S.C. — A local hospital, charged with accounting inaccuracies, collection blunders, and input ignorance, has thrown up its hands and returned to hand-posting its bills. Officials of Columbia Hospital have stopped adding new patients to the computer at a cooperative seven-hospital service bureau.

The non-profit bureau has successfully served the other six institutions since shortly after inception a year and a half ago.

Thomas Roach, assistant superintendent for fiscal affairs, has been fired while trying, he said, to "establish in-house equipment" to set personnel and equipment on the same course.

He said that the accounts receivable for the hospital have not been reconciled for six years, including the time of transition to computer, and that when he tried to establish more orderly in-house procedures, "I got fired. The hospital undid what I had done and went back to a hand-posting system."

County councilor Stuart C. Hope said that the problems were in part due to the programming, which prevented issuing a bill until three days after a patient was discharged.

He cautioned against blaming "data processing" for the fiasco, and said that the problems stemmed from being unprepared for computerization, and the delay that was built into the billing program.

No Complaints

But the professional consultant assigned to the service bureau's data center said that Columbia Hospital had not complained of any difficulties, adding that all seven institutions were using "identical" programs.

Richland County Attorney Joseph Sapp, a member of a committee to overhaul the hospital's finances, attributed the "inaccuracies of the billing system" to a "computer foul-up."

He also said he doubted that the hospital would return to the same data center, unless the program is changed to exclude the three-day delay.

The "political" problems created by the county-run hospital's need to justify repeated requests for more money were cited as reasons behind other officials' reluctance to discuss the situation.

But Roach was not so reluctant.

In referring to a local newspaperman's statement that the "computer lost the latest round" in an attempt at "taking over society," Roach indicated that it was the taxpayers who had lost the round.

For among the problems created by non-reconciliation of the hospital's financial statements is a million-dollar cash flow deficit. And, charged Roach, the bills still weren't being prepared promptly or correctly when he was fired in January.

Roach said that computerization was attempted without an accurate picture of accounts receivable, without proper instruction of hospital personnel, and most important, without any indoctrination as to how the computer was to assist in billing and payroll procedures.

With these three strikes against it, the hospital's board of directors reportedly halted adding names to the computer at the Hospital Data Center of South Carolina, a nonprofit organization directed by administrators and trustees of the seven hospitals.
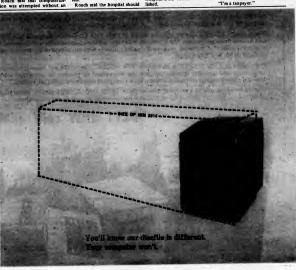
Roach said the hospital should "start from the beginning" by compiling a complete list of bills, punching the cards, and comparing a computer total.

Then, he said, the hospital should instruct its personnel in the preparation of bills so that the computer can assemble a complete, up-to-date and accurate account of a patient's stay as soon as he is discharged.

Actually, Roach said all this was needed the first time around, but he was only hired last August, ten months after the Hospital Data Center was established.

During his five-month tenure, he said, he tried to accomplish these procedures and maintain the accounts in "reasonable" fashion. He said his internal procedures could have been complete in March.

However, his fast-moving, or at least revolutionary ideas apparently upset the board of directors, who ordered his dismissal.

Roach now says that he hopes that computerization can be effected again, and with his suggestions adopted.

After all, Roach concluded; "I'm a taxpayer."

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You'll know our discfile is different.
Your computer won't.

Our new System/7000 Large Disc Store is totally compatible with System/360. That's all your computer cares about. Our new file has the same 2-billion bit capacity as the 2314. So what's different? The first thing you will notice is size. Our new discfile takes up about one-third the space of a 2314. More importantly, you'll notice a price difference. Our discfile systems run less than half the cost of the 2314. (OEM units without controllers cost even less.) Then you'll find the technical advantages: a non-hydraulic servo positioner and a new head design. We also have a model compatible with Univac's Fastrand II. Our continuing innovation in disc technology gives your computer the edge in performance and worry-free operation. Call your Systems Division office.

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Bell System Encourages Competition – With Conditions

By Ronald A. Frank
CW Communications Editor

NEW YORK – AT&T has officially encouraged the prospect of competition in the area of communications, with specific reservations.

Writing in the company's year-end report, AT&T Board Chairman H.I. Romnes noted the recent "proliferation of proposals put forth by organizations seeking to provide communications services."

Romnes said, "The Bell System does not seek protection from competition. Where competition

would benefit the public – in terms of lower costs or services that would not otherwise be available – competition should

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Communications

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be encouraged."

In encouraging non-Bell carriers, Romnes qualified his statement by saying that each proposed non-Bell communications system ought to be examined on

its specific merits.

He implied that Bell gave subscribers an overall cost advantage by questioning whether "the advantages to particular customers [that such non-Bell] systems might offer, [were] sufficient to warrant denying the larger public the economies of scale that derive from shared use of common [Bell] facilities."

Romnes questioned whether the authorization of competing inter-city systems would undermine the system of nationwide average pricing that permits Bell to charge equal prices in both

high- and low-volume usage areas.

Romnes said the abandonment of the present AT&T pricing system could result in a disadvantage to the country's less-heavily populated areas and ultimately "to the public as a whole."

He said the Bell System would abide by decisions which reflected "a sound appraisal of the public benefits involved" in the areas of communications. He said that long-run interests of communications users should be the prime consideration in resolving current data problems.

Interface Test Device Helps Data Users Troubleshoot Equipment

SOUTH HACKENSACK, N.J. – A test instrument that allows users to rapidly isolate interface problems between data modems and data terminals is available from Dataprobe Inc.

Designated the Model EIA 100, the test device gives a data user electrical access to each of the 25 wires in a standard EIA interface cable. By inserting a test probe into each pin of the interface cable connector, the operator can determine the status of the cable.

Instead of measuring exact voltages, indicator lights on the EIA 100 panel inform the operator whether the correct mark, space, and data levels are present.

According to Dataprobe President Sy Weiss, the test device allows a user to pinpoint data faults.

Model EIA 100

"By using this unit, the data user can determine whether his modem or his terminal is malfunctioning, thereby eliminating unnecessary service calls," he said.

Weiss said the EIA 100 is designed for use by those having a minimum of technical knowledge. He added that similar test devices to check other components in a data line are presently being developed.

AT&T has reportedly taken an interest in the Dataprobe unit and has requested a demonstration of the device.

The firm is located at 290 Huyler St.

Expect Data Head

WASHINGTON, D.C. – President Nixon will soon name a director of telecommunications policy. The appointment will be part of a reorganization of the telecommunications area which the administration recommended to Congress in a plan submitted February 9.

Included in the administration plan is an increase in the budget for the office of telecommunications management. The Nixon proposals are seen as an indication that the administration intends to take an increasing interest in the area of communications.

Memorex introduces the 3660. It replaces your 2314.

Our new 3660 disc storage system, complete with controller, gives you faster access time, higher system throughput, and greater reliability than the 2314. At 10 to 20% lower cost.

The new control unit interfaces directly with your System/360. No changes in hardware, no modifications in software. A single unit controls up to nine drives.

The drive is simple.

Reliable.

Proven.

We've demonstrated the dependability of our design in millions of hours of operation on over a thousand delivered drives.

MEMOREX

Editorials

Politics and the FCC

The Federal Communications Commission has retained an independent consultant to interpret the findings of a National Academy of Sciences study panel, also retained by the commission. At issue are problems resulting from the Carterfone decision which permits the connection of non-Bell data equipment to the telephone network.

It is becoming increasingly clear that the FCC, which consists of politically appointed members, does not have the technical expertise to deal with increasingly complex questions such as the transmission of computer data via various communications media.

A very fundamental question then arises. How can the FCC accurately and objectively formulate tariff regulations and rates, when apparently its members cannot fully comprehend the technical ramifications involved in these rulings?

Spotting the Phonies

The *Medford* (Ore.) *Mail-Tribune* recently editorially criticized computer-produced letters as follows: "We resent the implication that we are a simple-minded moron to be fooled by the versatility of an electronic gadget into thinking we're getting a 'personal' letter when we're not."

The editorial referred to the worst examples of these letters, the ones "with repeated references to name and address in the body of the messages."

Previously we were amused by these letters, feeling that they were simply a terrible waste of computing power. But now we feel compelled to look at them in the light that they may be hurting the image of computers.

We suggest that users always ask themselves: does the information to be inserted really add anything of interest to the reader? Or is it simply a gimmick that would never be used if the letters were being typed by a secretary?

If it's just a gimmick, we suggest it would be better to produce a real business letter, one that is individualized only by name, address, and "Dear Mr. Jones."

The gimmicks aren't fooling anyone . . . but they are antagonizing some people.

The Unconcerned

IN THE PLANNING
NATIONAL COMPUTER
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ACM
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JOHN MAHONEY

LOW COST UNIT

Guidely —

Letters to the Editor

Data Bank Restriction Suggestions Requested

Congress needs help from experts in the computer technology field on data security.

Let me frame the problem in this way. Two large national individual-file data banks are proposed in legislation before Congress in the form of the Job and Welfare Data Banks. The purposes they are designed to serve have my support. But, no restrictions or controls on their operation are contained in the legislation under consideration.

If you were a congressman, what restraints on the content, organization, and security would you recommend be spelled-out in the statutes creating these data centers?

Suggestions and any reference materials provided will be shared with my colleagues working on these measures.

Jackson E. Betts
U.S. Representative

House of Representatives
Washington, D.C.

CW would appreciate receiving copies of any suggestions which readers send to Rep. Betts. Ed.

The 'Output' Depends Entirely on the 'Input'

I have long admired your valuable contribution toward minority rights, justice, and right of privacy, etc. but was very disappointed to read "Computerized 'Super Fight' Seen as Unique Thrill for Sports Fans," [CW, Jan. 28]. You said, "Marciano 'scored' a 13th-round knockout over Clay, the deposed, draft-dodging heavy-weight champion, in a fight which settled the argument over the all-time championship."

Muhammad Ali has not been convicted of violating any Selective Service regulation. He applied for a conscientious objector classification from his draft board, which has never granted a C.O. classification to anyone.

He had his title taken away mostly because of his

unorthodox behavior, but also because he would not kowtow to Whitey.

And you of all people should know the garbage-in-garbage-out law. The only argument the "fight" settled was who the "experts" think is the all-time champion, since they were polled to provide the input. But there has never been any argument over whose side they have been on since before the Clay-Liston fight. And they were wrong then too.

Mark Albertson

166 West Brookline St.
Boston, Mass.

Non-College Programmers Have Fewer Choices

In regard to the article "Noncollege Programmers Show Better Loyalty" printed February 11, 1970.

Has the fact been overlooked that since there were less opportunities open to non-college programmers due to college degree requirements on 90% of the jobs open that less non-college programmers left their jobs?

I am sure you will find that the next survey will show this "unusual" circumstance will even out as the college requirement factor is lessened.

Nicholas Minadeo Jr.
President

Arisa Computer Services, Inc.
East Orange, N.J.

Computerworld welcomes comments from its readers. Preference will be given to letters of 250 words or less. Computerworld reserves the right to edit letters for purposes of clarity and brevity. Letters should be addressed to: Editor, Computerworld, 797 Washington Street, Newton, Mass. 02160.

The Trac Language

Inequities, Language Standards

While I was talking to the Resistors recently on technical subjects, the question came up about the Trac language. For two years now the Resistors have been using the Trac language on their PDP-8 system and they are currently in the last throes of preparing a Trac language manual. It's going to be a remarkably good manual, too. It even includes what might be called "strip cartoons" showing how the language works!

In the course of these conversations I learned that the continued usefulness of the language is seriously threatened. To explain just why, we have to go back a little bit – back to the ideas of Calvin Mooers, the inventor of the Trac language.

Standardization Failure

Cal is an unusual person, a man who invents two or three programming languages a year. One of his great interests is language standardization. If you once get him talking on the failures of standardization, as shown by Fortran and other "standard" computer languages, he is inclined to go on for some hours.

Now this doesn't make him any different from many managers. The pathetic status of standards is so well known that standardization ideas are considered to be a bore-by many people.

A Workable Method

Not however, by Cal. He put some thinking into this some

The Taylor Report

by

Alan Taylor

years ago and came up with a method for standardizing a language. Or to be even more precise, a method for a user to know that the language he was using was or was not worth-

while. To some extent it wasn't a new method but an old one. His idea was to control the name of the language, in this case the Trac language – just as back in the 1950s IBM had controlled the name of Fortran.

Historically the problems with Fortran became intensified when the name was allowed out into the public domain and lots of different languages became called "Fortran." This resulted in it

becoming a matter of "user beware" very quickly.

. . . That's Working!

This hasn't happened with the Trac language. The language is now actually getting wider and wider use. And when one of its users falls for "Trac" from s time-shared terminal, he is able to feel safe because it will conform with the standard definitions.

Objection Made

Unfortunately this happy state of affairs may not last much longer. One large company has decided that it is "inequitable" for the developer and originator of the language to be able to safeguard users in this way. Its people have apparently spent some money on looking at the language and now they want to be able to call any old language "Trac" – and sell it under that name.

If they get what they regard as an "equitable" solution, then users will no longer be able to rely on the Trac language being really "Trac." A very large corporation will have been able to take over the name – as well as the language – without paying a penny, while a very small, nonprofit organization will have lost out. Stendardization efforts will continue to be pathetic – and users will be the losers.

It doesn't seem a very equitable solution to me.

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The views expressed in this column do not necessarily reflect those of Computerworld.

Support Being Shown for the Resistors

Last week I talked about the efforts of the Resistors to find student papers suitable for presentation to the Spring Joint Computer Conference at Atlantic City. What I omitted to talk about was the financial effort that would be required to get a student to Atlantic City, assuming that he had a paper that was worthwhile.

Cash From IBM

I many have omitted this important point, but the Resistors didn't. They started organizing on this point sometime ago and can already report some successes. A $150 check, for instance, has been received from IBM Corp., sent on behalf of its chairman, Thomas J. Watson. The idea is to use this money to sponsor a student, and IBM is happy to let the Resistors select the student.

Burroughs Out Looking

Burroughs Corp. is also interested. They haven't sent their money directly to the Resistors; instead they have started trying to find suitable pre-college students with papers that will be worth sponsoring. They are quite naturally interested in the quality of the papers, and, while realizing that the Resistors will also do some rejection screening, want to see that the Burroughs-sponsored student would be able to pass technical muster before

committing the funds.

Actually the amount needed is not very great. The cost of a student stand-by ticket to Atlantic City from even California is under $200. The cost of hotels, etc. can be kept down to the minimum and of course there is always the possibility that suitable students will not

Alan Taylor, who has been user, writer, consultant, and editor of Computerworld, is president of Computer Management Aids Corp.

need sponsoring at all. However, it is comforting to realize that money is becoming available-to

help any student that does have a worthwhile paper to get to the conference.

Don't Hold Back for Cash

So, if you know of a youngster, don't hold him back because of the cash angle. There is still time to send details of his paper to the Resistors. The qualifications are simply – he has to be a pre-college student, and the paper should have something to do with computers and computer technology. That's all. If you know of anyone, urge them to write, phone, or wire The Resistors, RR 1, Box 257, Pennington, N.J. 08534 or just call in at the barn.

EDUCATION DIVISION

Viewpoint: Trade Secret Protection

Who 'Owns' Employee-Developed Programs

By David Bender
Special to Computerworld

When an employee develops a program (unpatented and uncopyrighted) in the course of his employment, who "owns" that program — the employer or the employee? Obviously the employer owns it in the sense that he can perpetually market and use it. But what are the employee's rights when he terminates his employment? Is he legally free to carry off the fruits of his labor and compete with his former employer?

As you may suspect, generally speaking there is no categorical answer to this question. This is as it should be — in any given situation the law must weigh the interests of both parties. The employee may feel his creation has earned him the "right" to the program. The employer, for his part, may feel that he has paid for the development, and that all rights in the end product should be his.

Moreover, the law is concerned with broad policy issues — what will be the effect on innovation and investment if employees are allowed to share in the fruits of their labor upon termination? Would companies be as likely to spend large sums of money on (and create many jobs in) technological development? The answer which the courts have reached is that development would suffer if no protection were granted. It is precisely because of the catalytic effect protection has on technology that our laws grant certain types of protection. But the employee's rights must be balanced against the social benefit, lest the individual be unduly restrained in his employment.

The type of protection we shall discuss here is trade secret protection. (To be sure, most of the material written about legal protection of programs concerns patent and copyright protection, but when the talking stops and the *doing* begins it turns out that by *far* the method most frequently *utilized* is trade secret protection.) Unlike patent and copyright law, which are federal, trade secret law is state law, and varies from state to state. However, there are some general rules which apply in most states, and the remainder of this article constitutes a broad-brush treatment of some of those rules.

Before reaching the law, it should be noted that we are here concerned with rights in an idea which, has been reduced to some form. We are *not* concerned with the *object* in which these ideas may be embodied. So, while a programmer might have the right to take a particular program, in general he will not, without permission, have the right to take a listing, deck, tape, or other *tangible* representation belonging to his employer.

The Law

Two crucial factors control the division of rights in software:

1. The first is the exact nature of the subject matter in question. If the employer is to have a right to protect the program against the employee's appropriation, the program must have some degree of novelty associated with it. It needn't be a "major breakthrough," but it must embody algorithms or techniques which are not common knowledge among the employer's competitors. If a large percentage of the firm's competitors are aware of these techniques and their value, the employee is free to appropriate the program.

To be sure, many states have extended the ambit of protection to entities lacking novelty, where their creation involved much effort and expenditure. Under such an interpretation, certain other categories of software would be protected, such as highly detailed but unsophisticated programs, and data bases. But it appears that even where this is the rule, there still exists the requirement that the subject matter be generally unavailable elsewhere. Hence, *the basic test is whether the subject matter constitutes the general skill, knowledge and experience of the trade as a whole, or whether it is particular to the employer* in question. If it is general, the employee may utilize it .

2. An additional requirement is that there be a confidential relationship between the employer and the employee. It is unnecessary 'that there be any contract to this effect (but a written agreement will greatly simplify evidentiary problems); if the employee has reason to believe that certain software is confidential and valuable, the employer needn't put the employee on notice that it is secret. So, for example, if program listings are stamped "Corporation Confidential," or if the employer takes significant steps to limit proliferation, an employee may reasonably be expected to be on notice that his employer , regards such a program as confidential.

Neither of the two conditions (i.e., proper subject matter and confidentiality) alone will give the employer the right to restrain his former employee from using the program, he cannot, for example, create a legal right for himself simply by labelling a program confidential. In any given case it may be doubtful whether either of these two conditions has been fulfilled. Unfortunately, many legal concepts are of an analog rather than a digital nature, and a given set of facts may be surrounded by a penumbra of uncertainty.

One noteworthy aspect of trade secret law is that the fact that the concept is carried-off in the employee's memory (rather than in some external form) is irrelevant. A further interesting aspect is that the appropriation of a trade secret may be a criminal offense. Although many states have been hesitant to extend their general theft statutes to cover trade secrets, there are now 17 states, including most of the major industrial states, which have express trade secret theft statutes.

It is recommended that the employment contract contain clauses directed at clearly defining the division of rights in software, in order to diminish the possibility of any subsequent misunderstanding.

The author is a research associate at the National Law Center, Computers-in-Law Institute, The George Washington University, Washington, D.C.

Air Force Gives Computer

EUSTIS, Fla. — The Board of Regents has approved an Air Force gift of a multimillion dollar computer system to the Florida State Nuclear Science Program.

The Xerox Data System computer saw service at the Cape Kennedy Space Center and will be installed by Florida State scientists as an on-line computer.

The computer system, which cost the Air Force several million dollars to develop, has a present market value of about $500,000.

All the COM you're ever likely to need.

The Memorex 1603 Microfilm Printer is reliable, efficient, inexpensive and on-line.

Direct-on-line.

From your System/360 to microfilm at 10,000 lines a minute.

The 1603 is a great COM device made simple by advanced use of fiber optics technology, and by a built-in control unit that makes it plug-to-plug compatible with your IBM 360.

It's the simplicity that makes the price right: $895 a month for the 1603 (including maintenance) compared with the $2,000 or $3,000 you'd expect to pay for non-simple off-line COM systems. Or even a line printer.

But there's more to a good COM than price. We added a "forms flash" projection system, line printer program compatibility, a plug board to control vertical forms spacing, an off-line testing feature, an automatic film length control. And the built-in control unit.

$895 a month.

Put them together and you have all the COM you're ever likely to need.

If you haven't already evaluated your needs against the 1603 and its low price, you should.

Write: Memorex, Santa Clara, Calif. 95050.

MEMOREX

Demonstration Held

IBM 360/195 Shows Its Power, Capability

By Peter L. Briggs
CW Software Editor

WHITE PLAINS, N.Y. — The super processing capabilities of the IBM 360/195 were graphically demonstrated here recently for members of the technical press. Using what the firm called an engineering prototype model of the giant computer, more than 500 jobs were processed using specially selected benchmark programs offered by prospective users and those attending the demonstration.
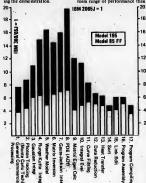
many different types of work shows the tremendous spread between slower commercial processing speeds and high speed specialized scientific calculations.

Sorting, compiling, linkage editing, and program assembly operations represent the slower speeds of the 195. These particular categories offer only a slight improvement over the capabilities of the 360/85.

The 85 has a much more uniform range of performance than

IBM 2065J = 1

Model 195
Model 85 FF

1. General Commercial Processing
1. (Monte Carlo Tech) Photon Tracking
2. Gaussian Integr
3. Runge-Kutta Integr
4. Weather Model
5. Matrix Inversion
6. Matrix Inversion
7. Gauss-Jackson Integr
8. PDE (ADI)
9. Matrix Eigen Calc
10. Integral Eval
11. Curve Fitting
12. Data Reduction
13. Heat Transfer
14. Sort
15. Link Edit
16. Program Assembly
17. Program Compiling

— Supplied by IBM

The figures shown are provided by IBM to illustrate the range of performance possible with the 195. The figures result from benchmark programs executed on the engineering prototype.

With most of its covers off and the miles of wiring exposed, and a mere few dozen peripheral devices attached, the machine appeared as large as a football field.

The operating demonstration consisted of a series of programs in about 15 job streams written in varying versions of Fortran, Cobol, PL/1, Algol, and Assembly Language.

The jobs were run under the full 100,000-byte configuration of the Operating System: Multiprogramming with a Variable number of Tasks (OS/MVT) on a one-million-byte Model 195.

Due to the speed of the system, the operator communicated with OS by means of a CRT about the size of a large console color TV that displayed about 50 or 60 lines at a time. The operator entered replies with a light-pen and keyboard. At some points during the demonstration, the screen was cycling a full display about every 30 seconds.

Capability Assessment

Comparing the 195 with the 360/65 and the 360/85 for

the 195. One observer has speculated that the 360/85, rather than the 360/65, was the optimal design point for the 360 family.

Particularly in those operations involving related real-number calculations, the ability of the 195 to multiprocess arithmetic instructions can greatly increase performance over the Model 85. (Two adds and either one multiply or one divide can be performed simultaneously on the 195).

Not A Modification

The 195 does not appear to be a redesign of an older 360 processor. The architecture is a planned development of new ideas within the framework, according to Julian Dowsky of the Systems Development Division.

There are three basic technological developments that make the 195 practicable. The first, a buffered high-speed memory, is similar to the one used previously on the 360/85. The second, multiprocessing of arithmetic and special-purpose in-

195 Seen As a True 360 Architectural Development

structures, allows the 195 to have a "specialty" in the areas where it needs most strength, like scientific research applications.

The third, instruction queueing and multiprocessed instruction evaluation, is new to the 360 family, and is inherent in the concept of "pipelining."

Buffer Memory

The basic principle of the 195 buffer memory is that a small segment of the total memory operates several times faster than the main memory. This buffer allows very rapid instruction access within a limited address range.

The high speed of this buffer, and the delays associated with memory accessing outside the buffer, cause bottlenecks in preparing instructions for processing.

The 195 buffer contains 512 8K-bit segments, and these are stacked with the most recently used segment at the top. The least recently used segment is replaced when a new segment must be loaded from the main memory.

With the delays associated with retrieving new "pages" for the buffer segments, a new technique for instruction fetching (the process of making instructions ready for processing) has been developed.

Need For Queueing

"Pipelining," as this special technique is known, allows the processor to fetch more than one instruction during any given machine cycle (54 nsec.)

The design goal for the 195 allows the processor to complete the execution of one instruction every basic memory cycle (54 nsec). This 54 nsec processing speed must include all the slower steps such as data fetching and execution processing.

To satisfy this speed criterion, several instructions are fetched during each machine cycle and held in a queue; one instruction is decoded during each cycle; several instructions are fetching data for execution during each cycle, and several instructions are being executed during each cycle.

Only one set of decoding logic circuitry is necessary to satisfy this requirement per 54 nsec because the decoding circuitry already pro- cesses instructions at this speed.

What Is Pipelining?

Pipelining is similar to the idea of trying to keep a large pipe filled. If you have a given amount of water needed to keep this pipe flowing at the optimum speed and the individual supply pipes cannot supply water fast enough, then you connect several supply pipes. This represents the Instruction Fetch Queue.

The large central pipe represents the Instruction Decoder.

To keep the flow even, you must also add pipes at the exit point from the large pipe. These pipes are the Data Fetch Queue and the Instruction Execution Queue.

By adding these extra pipes for instructions it is possible to keep the large central pipe running at top speed.

One observer suggested that it would be possible to speed up the processor by adding additional decoding circuitry, thus allowing the execution processor to process more than one instruction every machine cycle.

Dowsky pointed out that this would not help the problem, since the processor was already running at the basic cycle speed of the machine. It was not possible, he said, to speed up the decoding significantly. If it could have been speeded up, he continued, it would have been.

Theoretical Limitations

The only visible theoretical limitations in the application of the 195 come in the I/O area. Like the 360/85, the 195 is limited to three selector channels and one 2780 multiplexer channel. This allows the user to connect 24 control units on selector channels and 40 devices to the multiplexer channel, thus limiting the number of directly connected I/O devices to about 275.

Since no one has ever assembled a system with the maximum number of I/O units using either a 360/75, or 360/85, there seems little reason to suspect that this device limitation will seriously hinder the use of the 195.

Other limitations do arise in arithmetic processing, and long-distance branching.

The 195 utilizes a "paged" memory (up to 512 8K segments) with less than 1% of the total memory references falling outside the range of the stored pages, according to IBM.

Therefore it is theoretically possible to consider the speed of the main memory to be equal to the 54 nsec speed of the buffer. The main memory speed is actually 810 nsec/doubleword, however.

It is possible to branch outside of the stored memory segments, thus creating a major delay in instruction 'execution. This is ameliorated by overlap processing allowing other instructions to be continued while a given instruction awaits data from the main memory.

During the presentation and demonstration, Dowsky indicated he expects memory speeds to reach 1 nsec/word within the next generation of supercomputers. He was unable to indicate how this might be achieved, but said that this was the goal.

Most users, however, do not yet have the tools to accurately and carefully plan the schedule for a single medium-large computer, let alone one with the power of a 360/195.

Hotel System Computerized

PARIS — The first computerized hotel reservation system to serve all Europe will be put into operation by the end of 1971.

The international teletypewriter network will be linked to a computer system in Paris to provide travelers with instant reservations at hotels in major cities across the continent.

Hotels subscribing to the service will be listed in a catalogue according to class, price, and location.

Car/Puter Said to Deliver Autos at $125 Above Cost

NEW YORK – A new computerized information service claims...to give auto buyers a personalized quotation revealing the dealer's cost for any American car, including every option the buyer personally selects.

The buyer can use the computerized price quotation to make the best deal anywhere he can, or he can order his new car through the company for $125 over cost.

United Auto Brokers (UAB) began over four years ago but only became computerized this year when it tied in to the Leasco time-sharing service.

"What we did," said UAB President Arnold W. Wonsever, "was to create a data bank with all of the information available in the automotive industry, which was supplied to us by our participating dealers. The system does an on-line computation, totaling up a prospective buyer's specific requirements and prices out an automobile."

For a fee of $5, which is refunded when the car is purchased through UAB, the prospective buyer receives a computer coding form that lists all the options available for the make and model of his choice.

He checks off the options he wants and returns the form to the Car/Puter where it is processed by the Car/Puter.

The buyer then receives a side-by-side comparison of the dealer's cost and list price for the car and the options selected. Included is freight, pre-delivery service and other charges which are usually confusing to the average new car shopper.

It should be pointed out that dealers frequently differ in their definition of "cost price." Cost price includes the cost of servicing a car before it is delivered, and this cost differs among different dealers.

The buyer takes delivery from a franchised dealer in his own general area, where

he receives the full factory warranty and service.

"In a few months of operation UAB has already processed over 50,000 price quotations for individuals through its service. These have mainly come from employees of corporations, fraternal

groups, labor unions and civil service employees. The service has now been expanded to accommodate the general public," concluded UAB President Wonsever.

UAB is located at 1603 Bushwick Ave., Brooklyn, N.Y. 11207.

Letters to Computers Can Help

CHICAGO – A human's keypunch error, sometimes known as a "computer error," has spawned an amusing and happy-ending exchange of correspondence between two computers.

Originator of the correspondence was actually Roger Fischer, victim of a parking ticket for a car which he does not own.

That's the beginning. When a Chicago policeman forwarded his tickets for the day, a keypuncher made one mistake, and

Fischer was mailed the erroneous ticket. Several attempts at "human" correction failed, so Fischer used his company's keypunch machine to "write a letter" to the police department's computer.

Wishing the recipient "good luck," Fischer's letter concluded, "I hope you can make someone understand as apparently human letters to other humans are of no use."

The Circuit Court clerk corrected the error, and had some cards punched and sent to Fischer.

". . . Get Me Off Your Back"

The "reply" read as follows:

"Dear human. At last I found someone who understands my language. You don't know how frustrating it is to deal with the humans that run me. All day long they feed me a bunch of punched-up cards and give me orders. Then when something goes wrong, they blame me.

"No compassion, no love, just orders. Then you came into my life. You understand. You know that computers do not live by cards alone. As to your problem, you were right. It was a human error.

"When the punchcard was made up from the traffic ticket, it was punched to read the wrong license number. I asked my human operator if he could get me off your back. He said he'd talk to a human prosecutor, who would talk to a human judge, who would drop the charge, and then they'd wipe my memory bank clean."

Yale Professor Asks Computer Program Copyright Protection

WASHINGTON, D.C. – The associate dean at the Yale Law School has called on the courts to provide copyright protection for computer programs.

Addressing the February meeting of the Hopkins-Brookings lecture series here, Professor Ralph S. Brown Jr., suggested that protection was needed to avoid the secrecy of valuable ideas because secrecy "is often antithetical to their use."

Brown considered the need for protection from several viewpoints, including those of the computer software firms, authors and publishers, and customers such as libraries and universities.

He agreed that some forms of protection are needed in each area but that these probably fall within the traditional field of copyright law.

" . . . Patentable invention must deal with things, or, if that sounds too simple-minded, with 'physical quanta,' " he said, in rejection of a patent system for computer programs. The algorithm or flow chart, he said, does not lend itself to patent protection.

What is needed, he argued, is a method of protection which protects the investment made to develop a marketable program but which does not exclude others from use of the algorithm.

In Brown's opinion, copyright protection can be adapted to fit such a need. "Programs are appropriate subjects for copyright," he said, "and substantial copying by a competitor could be enjoined. . . . But if a prospective customer came lawfully into possession of the text of the program it does seem unlikely that he could be prevented from using it."

Electrostatic Printer Increases Printout From 8 to 200 Times

CLEVELAND, Ohio – "The electrostatic printer increases our printout capability anywhere from 8 to 200 times, depending on the application."

This is how Stanley Y. Curry, president of Chi Corp., Cleveland-based computer service firm, describes the Clevite 4800 electrostatic printer that has been in use at his installation.

Developed over a period of seven years, the Clevite 4800 insures that computers will no longer be bottled up by slow mechanical equipment, according to the manufacturer.

The printer reproduces signals from any source of digital input or data transmission by telemetry, radio microwave, or phone line.

"We took the 4800 on a trial basis to evaluate it for our applications, and found that it is useful for just about any output," said Curry.

At present, Chi uses the printer in three different areas: text editing, intermixing text and pictures, and for circuit diagrams, plotting and perspective drawings

of buildings.

"Primarily, we use it as a graphics output device," Curry said. "For example, for printed circuit drawings, the printer yields instantly, on paper, a drawing of the circuit. The designer can then correct or alter the circuit, obtain another drawing, correct it and so on until he evolves the exact circuit he wants."

Curry also cited the ability of the printer as a diagnostic aid during "core dump."

"You can dump all of the information in two minutes with the 4800, whereas it would take about ten times as long normally," he said.

The Clevite printer costs about $15,000. However, once the initial investment is made, the actual cost of printing is little more than the cost of the paper, Curry said.

CLEVITE

Close-up shows how Clevite 4800 electrostatic printer is capable of furnishing printed computer output as well as 3-dimensional drawings. The printer has a capability of 4,800 lines or 412,000 char/min.

Part I of Series Of Pa. Laws Is Computerized

WASHINGTON, D.C. – The first part of a multivolume series comprising the Pennsylvania rules and regulations has been computerized, photocomposed, and printed by Autocode, Inc.

The Commonwealth Documents Law of Pennsylvania, which was signed into law in 1968, provides that the state establish two publications, the Pennsylvania Code and the Pennsylvania Bulletin. These will constitute the Pennsylvania counterpart of the Federal Register and the code of Federal Regulations.

The two publications will consist of the administrative rules and regulations of such departments as health and public welfare within the state.

Under the terms of Autocode's four-year contract with the state, the company will print all of the Pennsylvania Code and provide an updating service for the contract period.

The Pennsylvania Code consists of 34 titles covering large areas of subject matter that roughly correspond to the major departments within the state. The first of these titles to be completed took four months to computerize and codify. The 34 titles will be completed in about three years, a spokesman for the company said.

It is expected that the computerization of the code will prove a valuable tool to the state, to the various department and agency heads, private practitioners within the state, and employees of the various departments by providing a retrieval capability to search the state's various rules and regulations.

The code will eventually be a fully annotated volume citing all Pennsylvania statutes and relevant court decisions.

Computer Helps Play Ball

DELAWARE, Ohio – Wesleyan has become the first state college to computerize its basketball statistics.

The computer is programmed to give game and cumulative statistics. It used to take the students three or four hours to compute them.

Wesleyan coach Frank Shannon finds the computer is one of the bright spots in an otherwise dismal season. The Bishops were 1-6 at the end of January.

Vocabulary Control System Simplifies Documentation

By Peter L. Briggs
CW Software Editor

ARLINGTON, Va. – Users with large libraries such as IBM manuals and system documentation can make Avocon (Automated Vocabulary Control) replace card indexes and lengthy searches, according to the package developer, Infodata Systems Inc.

The package is written in Cobol, and sells for $9,500, making it well worth while for an IBM OS/360 user who has trouble managing a library.

In principle, Avocon controls the words used to access information. For example, in order to find information about DOS and OS Cobol, a user could request everything listed under "Languages."

Narrowing down the search specifically to OS and DOS would reduce the amount of material retrieved. Further specifying Cobol would then produce all the Cobol documentation about OS and DOS Cobol. Adding the qualifier "differences" would produce the specific reference manual that compares OS and DOS Cobol.

Much Broader Application

Avocon does not actually look up anything, nor does it offer data management capabilities. What it does do is provide a hard-copy manual detailing the way in which information in a given library is filed, showing the keywords, the cross-reference indexes, and the hierarchy of indexes associated with a particular subject.

This can greatly simplify library maintenance, as well as retrieval. Only the right words are accepted for retrieval processing. When new documents are added, the system auto-

```
ANALYSIS (MATHEMATICS)
  1201
  THAT PART OF MATHEMATICS
  ARISING FROM THE CALCULUS
  WHICH DEALS PRIMARILY WITH
  FUNCTIONS
    NT  ASYMPTOTIC SERIES
    NT  CALCULUS
    NT  CONVERGENT SERIES
    NT  DIVERGENT SERIES
    NT  MACLAURIN SERIES
    NT  POWER SERIES
    NT  REAL VARIABLES
    NT  SERIES (MATHEMATICS)
    NT  TAYLORS SERIES
REAL VARIABLES
    BT  ANALYSIS (MATHEMATICS)
    NT  CALCULUS
    NT  CONVERGENT SERIES
    NT  DIVERGENT SERIES
    NT  MACLAURIN SERIES
    NT  POWER SERIES
    NT  SERIES (MATHEMATICS)
    NT  TAYLORS SERIES
CALCULUS
    BT  ANALYSIS (MATHEMATICS)
    NT  ASYMPTOTIC SERIES
    NT  CONVERGENT SERIES
    NT  DIVERGENT SERIES
    NT  MACLAURIN SERIES
    NT  POWER SERIES
    NT  SERIES (MATHEMATICS)
    NT  TAYLORS SERIES
SERIES (MATHEMATICS)
    BT  ANALYSIS (MATHEMATICS)
    BT  CALCULUS
    NT  REAL VARIABLES
    NT  ASYMPTOTIC SERIES
    NT  CONVERGENT SERIES
    NT  DIVERGENT SERIES
    NT  MACLAURIN SERIES
```
```
    NT  POWER SERIES
    NT  TAYLORS SERIES
CONVERGENT SERIES
    BT  ANALYSIS (MATHEMATICS)
    ST  CALCULUS
    ST  SERIES (MATHEMATICS)
    ST  REAL VARIABLES
DIVERGENT SERIES
    BT  ANALYSIS (MATHEMATICS)
    ST  CALCULUS
    ST  SERIES (MATHEMATICS)
    NT  ASYMPTOTIC SERIES
ASYMPTOTIC SERIES
    BT  ANALYSIS (MATHEMATICS)
    BT  CALCULUS
    BT  DIVERGENT SERIES
    BT  SERIES (MATHEMATICS)
    ST  REAL VARIABLES
POWER SERIES
    BT  ANALYSIS (MATHEMATICS)
    ST  CALCULUS
    ST  REAL VARIABLES
    ST  SERIES (MATHEMATICS)
    NT  MACLAURIN SERIES
    NT  TAYLORS SERIES
TAYLORS SERIES
    BT  ANALYSIS (MATHEMATICS)
    ST  CALCULUS
    ST  POWER SERIES
    ST  REAL VARIABLES
    ST  SERIES (MATHEMATICS)
    ST  MACLAURIN SERIES
MACLAURIN SERIES
    BT  ANALYSIS (MATHEMATICS)
    ST  CALCULUS
    ST  POWER SERIES
    ST  REAL VARIABLES
    BT  TAYLORS SERIES
```

Full thesaurus entry generated by Avocon from card input.

```
AMT1    ANALYSIS (MATHEMATICS)
ASC1    1201
AS11    THAT PART OF MATHEMATICS
AS21    ARISING FROM THE CALCULUS
AS31    WHICH DEALS PRIMARILY WITH
AS41    FUNCTIONS

AMT2    REAL VARIABLES
ABT2    ANALYSIS (MATHEMATICS)

AMT3    CALCULUS
ABT3    REAL VARIABLES

AMT4    SERIES (MATHEMATICS)
ABT4    CALCULUS

AMT5    CONVERGENT SERIES
ABT5    SERIES (MATHEMATICS)

AMT6    DIVERGENT SERIES
ABT6    SERIES (MATHEMATICS)

AMT7    ASYMPTOTIC SERIES
ABT7    DIVERGENT SERIES

AMT8    POWER SERIES
ABT8    SERIES (MATHEMATICS)

AMT9    TAYLORS SERIES
ABT9    POWER SERIES

AMT10   MACLAURIN SERIES
ABT10   TAYLORS SERIES
```

Content of punched card input to Avocon with immediately broader term BT "Thread."

matically cross-files the references to the appropriate reference structures so that someone looking for information from a different viewpoint will have less difficulty.

Avocon, according to the company, is completely compatible with the Nasa/Department of Defense standards for such thesaurus files, and complies with federal guidelines for vocabulary construction and usage.

The system input consists of a list of topics, main cross-references, and sub-topics. The computer processes this information and produces a complete indexed list of all relevant topics and keywords.

The output, in the form of a thesaurus, can be used to look up the words to find specific types of information, and can act as a guideline for indexing new material entered into the system.

The company's offices are located here at 1901 North Fort Meyer Drive.

Spectra 70/46 Users Test, Debug, Create Cobol Programs Remotely with 'RCPD'

TORONTO, Ont. – Remote Cobol Program Development (RCPD) is a conversational terminal-oriented system which allows programmers to create, debug and test Cobol programs from a remote keyboard terminal, according to the developer, AGT Data Systems Ltd.

The company says that initial usage of RCPD has shown programmer productivity improvements in excess of 30%. In addition, in-house testing has reportedly shown that RCPD also improves the skill level of the programming staff.

The system operates on an RCA Spectra 70/46, which has 256K main core memory with four-million bytes virtual memory. A company spokesman said that the system could be mod-

ified for other virtual memory computers such as the IBM 360/67.

The purchase price of $50,000 for RCPD includes an educational and support program covering a pre-installation course, a representative on-site during the initial installation phase, and continuing support, the company stated.

A subscriber cost basis is also available for RCPD users. The charges are based on AGT's standard time-sharing rates – $10 a connect hour and one cent a statement for compilations. A user can submit runs in the background with a charge for compilations, not for CPU usage.

AGT's Data Centre is located at 74 Victoria St.

'Rapid' Reports, Analyses Drug Profits

NEW YORK – A system designed to provide the wholesale drug industry with a faster, more thorough means to perform major accounting functions is being used by Yshr-Lange, a large drug wholesaler in Milwaukee, Wis.

Developed by Cambridge Com-

"I Can't Find Anything Wrong — But Let's Feed Your Complaints to the Computer . . ."

puter Corp., Rapid (Reporting, Affecting Profits in Drugs) performs functions such as preparing customer invoices, and reporting and controlling inventory.

"Rapid offers its users a remote facility management setup in the form of a terminal device

that absorbs and feeds information into centralized company computers, which, in turn, analyze and report back to the drug wholesaler the information required," claims Mr. E.A. Hammerle, company president.

The many reports produced help the firm manage inventory, control purchasing, and improve profit margins, according to the company.

"Rapid also helps analyze sales and maintains and updates both accounts payable and accounts receivable," Hammerle continued. "No matter how fast a drug wholesaler's growth may be, his business won't outgrow the system."

Rapid may be acquired as a package, cost varying with individual users, or as a service that includes consulting support on an ongoing basis. The system may be installed for certain companies in three months.

The package operates on IBM 360/30s and up and requires at least 56K core memory.

Cambridge Computer Corp. is located at 90 Park Ave.

Spring Brings RPG to 1800 Users

WHITE PLAINS, N.Y. – IBM 1800 users will have a Report Program Generator compiler this spring, according to a company announcement. RPG offers report generation and general commercial processing capabilities for the 1800 – primarily a data acquisition and control-oriented system.

Designed to assist users in handling applications including payroll, accounting, and inventory, 1800 RPG will run

under the 1800 Multiprogramming Executive (MPX). According to IBM, RPG is widely used on the 1130s and 360/20s in the field.

1800 RPG will be licensed for $60/mo.

IBM also announced the forthcoming availability of an expanded MPX. The new version will permit users to connect the IBM 2770 data communications system to the 1800.

'Good Morning, Mr. Phelps'

NEW YORK – Right out of *Mission Impossible* comes this program testing and debugging module that will self-destruct after its approval period is up. Built for the IBM 360, the module runs under the Disk Operating System, according to Information Synthesis Inc., the developer.

The program records data exceptions, specification exceptions, addressing exceptions, and all other 360-recognized programming errors on the console. If possible, the program continues to execute, and the debug module detects as many errors as possible in one run.

Invalid data formats are corrected, allowing the program complete arithmetic operations. An operator intervention sub-module allows the user to alter core locations, branch to a specified address, take a snapshot dump of the program, or branch to an end-of-job routine, the company reported.

Fifty potential customers received this self-destruct program and its documentation, the company said. No elaborate installation is required, according to a company spokesman.

The module sells for $275 from the company's offices at 663 Fifth Ave.

'Data/360' Turns CRT Terminals Into Keyboard-to-Disk System

WHITE PLAINS, N.Y. – With Data/360, a new IBM program, video terminals with keyboards can be used to enter source data directly into a computer.

The program simulates the card-image inputs of the IBM 029 keypunch and 059 verifier. Users enter data from IBM 2260 display stations to an IBM 2311 or 2314 direct access disk storage device, bypassing punched cards in applications not requiring a unit record of the entry.

As the operator keys data on the alphanumeric keyboard of the 2260, it is displayed on the terminal's screen. The operator can verify the accuracy of the data being entered with a glance at the screen, backspace to correct errors, and resume keying data, according to IBM. Key verification can be accomplished by re-entering the data and allowing the computer to compare it with the original entry.

Data/360 will run on an IBM 360/30 or larger with at least 64K bytes of core storage. The program operates under DOS/360 and is written in Assembly Language.

The program, scheduled for delivery in the fourth quarter of 1970, will support up to 24 IBM 2260 display stations. Data/360 is offered under a license agreement at a monthly charge of $50.

Accounts Receivable Package Saves Time

ENCINO, Calif. – A multiple-client accounts receivable system economizes processing time by performing operations in one pass of the master file. The system also prints statements two-up and can be installed in one week by Computer Applied Systems Inc.

Designated Casars (CAS's Accounts Receivable System), the package provides automatic repeat invoicing, general ledger account totals, variable heading and trailing messages on statements, work-in-process accounting, and client combinations of open items and balance forward statements. All financial reports show aged balances.

Four Cobol programs and two sorts comprise the total system.

Casars costs $15,000. The system may be leased.

Computer Applied Systems Inc. is located at 18075 Ventura Blvd.

'Eascum' Meets Credit Union Requirement and HEW Rules

SOUTH BEND, Ind. – Eascum III is an accounting system for credit union management from the St. Joseph Bank commputer center.

The firm says that Eascum meets credit union accounting requirements and complies with federal regulations from the Department of Health, Education, and Welfare.

Eascum III is written in Cobol, and can be run on an IBM System 360/25, a Honeywell 200, and an NCR Century 100 or 200. The program requires a minimum of 32K.

Deliveries are to begin this quarter from the company's offices here at 202 South Michigan St.

T/S Program Simulates Digital 'ogic Circuitry

FORT LAUDERDALE, Fla. – Logcal is designed to simulate digital circuitry in an interactive environment according to its developer, Compu-Time Inc.

Available with the company's time-sharing system, Logcal simulates the operation of all standard logic elements including gates, converters, inverters, flip-flop circuits, and shift registers, the company said. Logcal's library includes over 740 logic elements with an arbitrary number of inputs, the company said.

Some users of Logcal have completed circuits in one day that would ordinarily require three weeks of manual analysis, the company claimed.

Several levels of checking are provided – from an overall check for the proper circuit logic down to a detailed trace of circuit operation. Marginal testing can be done directly over the terminal, and circuit elements can be modified on-line, according to the firm.

Compu-Time provides time-sharing service from its offices here at 2455 E. Sunrise Blvd.

East is East and West is West
and a punch card can't tell the difference.

Once upon a time, Latin was the universal language of educated men.

But now the whole world speaks keypunch.

That's how come we can save you 50% *and more* on your next keypunching job.

Because we keypunch in the British crown colony of Hong Kong.

10-day turnaround, 99.8% accuracy guaranteed.

And *half the price* you're paying now.

How can we do it?

Well, in Hong Kong, being a keypunch operator is a very desirable, highly-paid job.

(Maybe it has something to do with our traditions. After all, we *invented* computers.)

Whatever the reason, our girls come from the top educational level of the job market. We only hire 4 out of every hundred applicants! Since everyone in Hong Kong speaks English as well as

Chinese . . . all our girls do, too. And they all go through the standard 3-week IBM keypunch training program.

We've provided them with 029's and 059's to produce more than 100 million keystrokes a month, in a modern, air-conditioned building.

We pick up your keypunch job today and hand-deliver it onto one of our daily air freight flights direct to Hong Kong.

Our people on the other end pick it up and turn the material over to our smart Chinese girls.

Ten days later you get it back, on genuine IBM cards. The accuracy is 99.8% or better, and we guarantee it. The price is *half*, or *less*, what you'd pay in the United States. And you can get your output on magnetic tape at no extra charge.

On larger jobs, it takes us longer . . . just like anyone else.

But the quality is the same, whether it's 5,000 cards or a

million.

We're not asking for your largest job right away.

Try us out on a smaller one. Call one of our offices in Boston, New York, or San Francisco. (We may refer you to a closer office; we're opening new ones every month.)

Let us prove to you that **a punch card doesn't know** whether it was punched in Hong Kong or Hartford.

Only your comptroller will know for sure.

🆔 china data systems corporation

New York, N.Y. (212) 986-9680
Palo Alto, Calif. (415) 328-7140
U.S. headquarters
47 MacArthur Road Wellesley,
Mass. 02181 (617) 237-3422

China Data Systems Corporation is actively seeking representation in every major U.S. city. Interested individuals or service bureaus may contact any of the above offices.

'CPMS' Produces Critical Path Diagrams Directly From Activity Information

SACRAMENTO, Calif. – The Computer Plotting Matrix System (CPMS) developed by Tevco Inc. produces Critical Path Method (CPM) network diagrams, at computer plotting speeds.

To get finished copies of critical path networks ready to be reproduced or displayed with the system, a project scheduler roughs out a preliminary network sketch and transmits the normal activity input data to the computer.

This is the only manual task required, the company claims.

Management System Measures Efficiency Of OS/360/40s and Up

LOS ANGELES – Cims (Computer Installation Management System) gives users an opportunity to measure the efficiency of the operation of their OS/360 multiprogramming systems.

Boothe Resources International Inc. has developed Cims to analyze such systems in operation, and to indicate the particular areas where problems and bottlenecks occur, the company claims.

Designed for use on 360/40s and up, Cims is written in Assembly Language.

The resident modules require 1K of memory. Other modules produce the two major reports, the resource management report and the core utilization graph.

The resource report contains date run, core required, start time, completion time, program name, and CPU time.

The graph shows core utilization by program, as a function of the time of day.

Cims sells for $3,500, which includes maintenance to interface it with the appropriate level of OS, complete documentation, and on-site installation.

The package is available from the company's offices at 3435 Wilshire Blvd.

360 Letter Generator Reduces Preparation

WASHINGTON, D.C. – A generalized computer letter generator for the IBM S/360 reduces the amount of programming time required for letter preparation, according to Programming Sciences Inc., the developer.

The General Letter Package (GLP) produces a personalized letter with minimal programming in just a few hours, the company said.

Previously, according to PSI, tailor-made programs had to be written to produce personalized letters of differing format. Using control cards containing the unique data, GLP inserts variable information into each letter and adjusts line format accordingly.

GLP operates under the Disk Operating System and requires a minimum partition size of 40K. It is written in Assembly Language and can operate with the minimum DOS I/O configuration.

The system is available from the company's offices here at 1000 Connecticut Ave., N.W.

Using CPMS, node numbering is automatic, and the incremental plotter routine does away with the need for manual drafting, according to the developer.

The activity cards prepared to generate the finished network drawings may also be used as computer input to any activity-oriented Pert or critical path scheduling programs.

CPMS includes concise instructions in all techniques needed to generate finished drawings and a special plotting form which assists development of the preliminary network sketch, the company said. The form numbers all network nodes and provides a method to interface activities between network sheets.

Critical path networks, inked and lettered, are the final drawings. The networks have activity descriptions, durations, resource and responsibility data, milestone nodes and node numbers. Descriptive annotations are also plotted.

CPMS is written in basic Fortran IV and can be used with most hardware. Immediate delivery is available for the IBM 1130 with 8K storage and an incremental plotter.

The software is available on a lease basis for a one-time charge. CPMS was developed by CPM Management Services and PMT Associates, a division of Tevco Inc., 3260 Jay Street.

Spectra 70 Multi-Function Utility Improves Card/Tape/Print Functions

EAST ORANGE, N.J. – A multifunction utility package for the RCA Spectra 70 computer is called the Spectra Composite Utility Program (Scup), according to its developer, CGA Computer Associates Inc.

Scup was designed to improve operations- like tape/card/print, and the user can select several different utility functions without additional operator intervention, the company claims.

Record-handling capabilities include selective record extraction, tape positioning, test file building, record reblocking, and print formatting, according to the company.

The package is written in Assembly Language, and uses 8K of memory.

The $2,000 price includes documentation.

The company's offices are located here at 715 Park Ave.

3M takes
the next step.

Computer tape that guards itself.

Now, from the pioneers of computer tape, comes another major breakthrough in tape technology. A new "Scotch" Brand computer tape that effectively resists physical handling damage! There's more to come, but for advance information, write Market Services Dept., Magnetic Products Division, 3M Center, St. Paul, Minn. 55101.

3M COMPANY

Main Program of Psi-Valet

S/360 Data File Retrieval System Creates Card-Image Central Library

LOMBARD, Ill. — Any card-image data file can be stored, retrieved, or updated with Psi-Valet, according to Panophic Systems Inc., the developer.

Operating under either DOS or OS on any 360/25 or larger, this three-phase system requires 22K, and will run in any batch partition, according to the company.

The program creates a central library for such card-image files, eliminating the need for card storage for programs or job control decks. Because the entire job stream can be stored on disk, Psi-Valet improves performance, for any job by eliminating the card read-time during a run.

The package uses random access files, and file reorganization is not required, the company says. All additions can be sequenced, and files can be transferred between different storage volumes without format considerations.

Security Features

Psi-Valet provides features to maintain data security for files stored under the system. All or any portion of the library can be reproduced on tape, disk, or the printer, but programs with a production status indicator cannot be modified or deleted without using special codes.

All library activity and modifications are recorded and reported by date, status, and modification number for each program and file. Special backup tapes are produced to provide emergency recovery, should a library be destroyed.

Psi-Valet is licensed for a three-year period for $2,880 which includes manuals, installation, training, and maintenance support. The company is located at 230 East Roosevelt Road.

'Mifacs' Processes Patient Billing and Accounts Receivable

OAK BROOK, Ill. — The Medical Institutions Financial Accounting System (Mifacs) processes patient billing, accounts receivable, inventory, payroll/personnel, and accounts payable for hospitals, according to Executive Computer Systems Inc.

ECS is marketing the package for the Wisconsin Hospital Data Processing Center, a division of Associated Hospital Service Inc.

The system can handle either remote or local input with or without teleprocessing. Mifacs is based on the IBM Shared Hospital Accounting System (Shas), and consists of five subsystems written in RPG, Assembly Language, and Cobol, the company said.

Without teleprocessing, the system requires a machine with at least 48K. With teleprocessing, the system requires a machine with at least 128K. Minimum peripheral requirements are two tape drives and three 2311 disks.

The complete package sells for $50,000. Individual subsystems can be purchased separately. Monthly maintenance, which includes continuing updates to the system's capabilities, costs $500, the company said.

Mifacs is currently processing at eight hospitals with a total of over 2,000 beds, and has been in operation for over two years, according to ECS.

ECS offices are located here at 1211 West 22nd St., Executive Plaza East.

Computerized Typesetting Competes With Hot Metal

LAKE SUCCESS, N.Y. — Economical use of computerized typesetting for one-time publications has been demonstrated by Alphanumeric Inc.

Called Textran, the service uses CRT systems for typesetting. The company claims that Textran is competitive with hot metal typesetting for novels, magazines, and textbooks.

Service is being offered from three central locations: New York City, Los Angeles, and Chicago. The company has also made arrangements with two French firms to offer the service in Europe.

The system operates through the IBM Magnetic Tape Selectric Typewriter (MT/ST) unit, available from IBM for about $300 per month. The company processes user-prepared MT/ST cartridges and produces finished galleys in any fonts, styles, and sizes.

The company says it builds its own CRT printers, and sells them to IBM. The firm is located at 10 Nevada Drive.

COMPUTERWORLD

1970 Independent Peripherals Supplement

Federal Reports Boost Independent Peripheral Use

By Frank Piasta
CW Staff Writer

Computer Output Microfilmer Inputs 360 Tapes.

Fifteen Units Pool Onto One Tape

Disk Control Units Compatible With IBM 2311 and 2314 Drives.

Sometimes it seems that there will be no end to the new peripherals becoming available.

The computer peripheral market has expanded to embrace not only those devices that mainframe manufacturers do not sell, but also similar devices that offer better price/performance ratios than original equipment.

Almost anything you can connect to a mainframe, including memories, can be had from one or another independent supplier.

Why this expansion? To save money, among other reasons.

Today's tight money market and declining corporate profits mean tight budgets. Departments, including DP, simply cannot get the funds that they need.

One solution to this dilemma is to get lower priced peripheral units. The claims of plug-to-plug compatibility and high levels of performance hold the promise of increased savings without sacrificing performance or reliability.

Federal Study Shows Savings

A recent report by the federal Government Accounting Office (GAO) shows that savings in rental costs alone can be considerable.

It reveals, for example, that the use of plug-to-plug compatible equipment can save up to $250/month per tape drive and up to $140/month per disk drive.

The report defined plug-to-plug compatibility as meaning directly interchangeable with other manufacturer's components and not requiring either hardware or software modifications.

Several large companies, representing a cross-section of industries, cooperated with the GAO in preparing this report. One corporation reported savings of $129,000 on tape drive rental costs.

This applied to 32 drives, but figures shown in the report indicated that savings of $1,280 per month on rentals and $113,000 on purchase were reasonable for an installation of four tape drives and two disk drives.

User Cautious

If the savings are so significant, why hasn't everyone gone to the independents to get their peripherals?

Users have been cautious, testing the new equipment on known systems and taking short-term leases until they find out if they can really save as much as they thought.

The growing sales volume of the independent suppliers indicates that these tests have turned out well. This is not surprising, since some of the equipment makers have been in business for quite a while. They are just now beginning to sell to users as well as mainframe manufacturers.

The user who goes the independent route, then, may be getting an identical piece of equipment, made on the same assembly line; the only difference is the nameplate, service responsibility, and — cost.

Cornucopia

The independently manufactured equipment available now includes virtually every type of peripheral sold by systems manufacturers, as well as some that are not. The list includes such items as card-readers, cardpunches, printers, magnetic tape units, magnetic disk units, audio-response systems, and many others.

Because this list is so varied, and represents so many different types of application-oriented equipment, it is possible for users to tailor computer systems to nearly any use.

Third Party Leasing

A new type of service, third party leasing, is appearing with

the emergence of the independent peripheral manufacturers. These firms buy equipment from various manufacturers and retail it, frequently under their own name, on a rental or lease basis.

The vendor assumes responsibility for maintenance under this system, though he sometimes has the cooperation of the original manufacturer. Such leasing companies account for most of the sales of the independent peripheral makers, according to industry experts.

Been Around a While

The principal manufacturers of computers have frequently used products from other independent manufacturers. This was done when the development costs for a particular device would have been too high or when the expected demand was too low to justify the manufacturing costs.

In certain cases, outside manufacturers were chosen because they already had a product. It was needed to fill a gap in the peripheral line for a major manufacturer, and speed of delivery was important.

The computer manufacturers, particularly IBM, have acted as suppliers to their competitors. One manufacturer's salesmen might have praised their own products at the expense of the corresponding product from the manufacturer who actually was building both devices. The only differences were in the nameplates placed on the machine, and perhaps the colors.

Users Identify Weaknesses In MICR Design, Features

By Frank Piasta
CW Staff Writer

Magnetic Ink Character Recognition (MICR) readers are available only through mainframe manufacturers, and users are looking for more equipment. CW gave MICR users a chance to suggest features that should be included on such new machines.

Judging by the response to CW's questions, transport mechanisms need the most modification. Mechanical transports are subject to jams, especially at the read station.

One solution was a vacuum feed to improve accessibility, reliability, and transport throughput. A vacuum transport would also need less maintenance than the common mechanical feed, users thought.

There were requests for an improved input pickup. Many users thought this could also be accomplished by a vacuum mechanism to take each document from the input feed, rather than the normal mechanical device, which is prone to slippage.

Maintenance was a sore point with most users. They felt the readers were too sensitive to dust and dirt, and far too often thrown out of alignment by paper clips, staples, rubber bands, and so on. Photoelectric readers seem to be particularly vulnerable to dust.

Users said they were willing to pay for the increased reliability of a dual recognition system,

using both MICR and optical reading methods.

The endorsing mechanism, which prints a bank's 'stamp' on the back of each check, came in for its share of criticism. All too frequently they don't print evenly or the imprint is illegible. Users had no remedy for this, but hoped something could be done.

One suggestion was for a new transport mechanism that would immediately re-read a misread document rather than sorting it into a reject pocket. Though a whole new design would be expensive, users say that a document can frequently be read on a second pass.

Several users complained that there was too much wired logic built into the readers. The consensus was that they would prefer the flexibility of software control even at higher cost.

The multicolumn select feature is currently offered at extra cost on some units. This should be standard on all models, according to users who believe it to be essential to the operation of the readers.

One DP manager evidently has operators with tired feet, because he would like to see storage racks above the reader so that the operators would not have to walk as far as they do now. As it happens, several firms currently manufacture such racks.

And one request was universal — lower prices.

User Environment Changing

As Companies Cut DP Budgets, Users Look for Savings

By Frank Piasta
CW Staff Writer

Rising costs and more sophisticated users are the main reasons for the spectacular increase predicted in user acceptance of independent peripherals.

The actions of the federal government in fighting to establish standards for the industry and in calling the attention of its agencies to the advantages of using independent suppliers have influenced users towards independent peripherals.

Rising costs have forced the DP manager to cut corners when he can.

The rising cost of personnel, estimated up to twice as high as the equipment costs, has forced a reappraisal of equipment budgets.

"At this point, we have to look at our operation and say 'What are we getting for our money? . . . How can we get a better cost/performance ratio?'" said a director of one large DP center.

With growing awareness on the part of the installation manager, there will be less and less reliance on the mainframe manufacturer as the source for all of his equipment. The rapid expansion of product lines throughout most of the peripherals industry will also increase user interest and confidence.

Future Developments

"This equipment will be necessary," according to J.G. Fitzgibbons, vice-president of marketing, Memorex Corp., "to take advantage of the expected sixfold increase in price/performance that will be offered by the next generation of computers."

To make use of this increase, he says, new applications will be developed that will cause companies to develop new peripherals.

It indicates that the direction the industry will take is toward the development of subsystems and away from the stand-alone, dedicated device.

Fitzgibbons says that the subsystem concept, by making use of industry standards, will make it easier for the user to utilize equipment built by independent manufacturers.

Government Influence

The actions of the federal government in motivating industry standards will be a key factor in the growth of the independent peripherals concept, he thinks.

Service Growth

Increased service facilities throughout the industry will keep pace with the increase in installed equipment.

R.L. Slover, marketing manager for Ampex Corp., says, "The key to the market-place is service. In line with this, Ampex will not over-extend its service facilities by just selling willynilly in any city in any quantity.

"We have planned a city-by-city penetration, and we open up an additional city every quarter, but only as fast as we can hire and train proper service personnel," he says.

"We feel that this is a long-term market," he continued, "not something that will disappear tomorrow, and we want to be in it ten years from now. The way to do that is to build a reputation for supporting the products that we deliver."

Potter Instrument Co., according to William Sharp, vice-president of marketing, expects 1970 to show an increase in the trend toward the use of third-party peripherals.

"This swing," he continues, "will accelerate as more and more DP managers recognize that they offer a path toward improved cost/performance for their systems.

"The expansion of the product lines of computer manufacturers will bring about an increase in the application of independent peripherals; they allow the system manufacturer to provide his customers with all of the varieties of devices required by their customers," Sharp commented.

Key-Entry Growth

"The growth rate, at least in our part of the market, will be exponential," according to a spokesman for one of the newer companies in the key-to-disk area. As an example, he cited the recent growth in firms offering key-entry equipment.

However, one industry figure feels that these forecasts may be exaggerated.

As an executive of one of the largest firms in the peripherals industry, he feels that there will certainly be growth, but not as dramatic as some people are claiming.

He expresses a strong belief in the expansion of keyboard devices and feels that this segment the industry will experience a much more rapid growth than the rest of the industry.

Reports Show Dual Maintenance Presents No Problem for I/P User

By Frank Piasta
CW Staff Writer

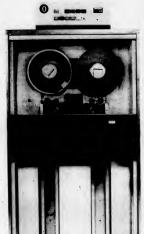One possible trouble spot for a user of independent peripheral equipment is dual maintenance, having field engineers of two or more companies servicing a mixed system. A malfunction in one piece of equipment in a complex system can degrade the performance of other parts of the system, so cooperation between maintenance personnel is vital.

Users say that dual maintenance has not been a major source of problems, and that maintenance teams of different companies do work together smoothly, in general.

Some users reported, though, that it took customer pressure on mainframe manufacturers to eliminate friction between servicemen.

The IBM Philosophy

The comments of one DP manager at an installation with IBM equipment illustrate the consensus. He said that the IBM customer engineers did not go out of their way to help other maintenance teams, but if they were asked for assistance by either the user or another service group, they worked diligently to diagnose and correct problems.

Another user fear is the deterioration of relations with the CPU builder. Users have become accustomed to what they believe is a high level of customer training, high quality systems support, and good responsiveness to software problems.

So far, at least, this hasn't changed. Mainframe makers haven't been overjoyed at the attachment of foreign equipment to their machines, but they have maintained a good degree of cooperation. One peripheral maker reported he was having trouble getting connecting cable from IBM on time, but when he asked his customer to order the cable, the problem cleared up.

Good Cooperation

In one installation where MAI equipment was attached to a System/360, the IBM engineers cooperated with the peripheral makers' personnel on interfacing. This cooperation solved the hardware difficulties that had plagued the system, the user said.

This same customer said that IBM had tried to dissuade him from installing plug-to-plug compatible equipment.

IBM is reported to have raised questions about the ability of other suppliers' field engineers to understand the System/360 CPU, among other things.

Once the equipment was installed, though, the IBM customer engineers cooperated closely with the MAI people. The user said that the IBM engineers did not go out of their way to help without specific request. If asked for help, IBM people do run diagnostic tests and help define causes of problems.

Regular Meetings

Another user said he felt that IBM had been making "an extra effort" to resolve service problems. The IBM customer engineer at his installation meets regularly with the Telex engineer to review operations and for preventive diagnosis. These sessions include reviews of the Telex equipment.

A third user reported a slight decrease in IBM sales and education service, though he believes this is only temporary. He also said that it is unlikely that IBM service personnel would stop cooperating with other engineers. The current wave of antitrust suits, he said, protect him from retaliation by IBM.

IBM Loses Its Monopoly on New Ideas and Machines

By Luther A. Schwalm
Special to Computerworld

There is no doubt that the independent peripheral equipment suppliers have made a substantial impact during the past year. Few companies have been involved yet, though many companies are now active in the business.

One reason some companies may suffer is the lack of adequate financing and maintenance capability, even with excellent products.

IBM Built the Market

At one time IBM seemed to have a monopoly on "something new" in this industry. It was usually IBM that came out with a new design, a faster device, or a complete new system such as

the 360 and most recently, the System/3.

In the past few years, however, other companies such as RCA, Sperry Rand, CDC, Burroughs, and Honeywell have penetrated this IBM-created market very effectively. Although IBM retains better than 70% of the total computer market, the remaining 30% is still enormous, and leaves room for many different companies with many different products.

This is really the market for the independent peripheral manufacturer. It is even larger than that 30% would indicate, as more and more IBM customers begin to sample outside-manufactured equipment.

Why IBM's Prices Are High

IBM has always been credited

for having a high price tag on much of its equipment. This stems from the time, years ago, when IBM had no competition. Over the years, IBM has built a powerful and high-quality marketing and sales force. With this sales force, it has been able to increase its market while still maintaining high prices.

As long as IBM can continue to sell at these prices, and it is, there is simply no reason for it to change them.

With more and more vigorous competition, however, this could be changed. Independent companies have built marketing and sales organizations that can compete with IBM, and sell their equipment for much less money.

Product Range Still Limited

The range of plug-to-plug com-

patible products is still rather limited. Tapes and disks are the only units installed in any quantities, at present, but others are being developed.

Other types of compatible equipment have been announced, but none are still to be delivered.

The next few years will show great improvements in the list of independent peripherals available to users. The biggest key to this will be adequate financing to support good service, and the development of stronger sales forces. Third-party maintenance offers one chance for underfinanced companies to service their equipment better.

With such a potentially large market, many companies are getting into the act, and the competition is going to be very stiff.

This competition will do one thing for users — it will probably force prices down and improve general support.

Why Better Products?

What does this offer the user? The independent peripheral manufacturer can design and build equipment at less cost than a larger company. Overhead is less, and trained personnel are more available.

Users do not come in any particular pattern. They represent a cross-section from every type of industry and the government. They do tend, to date, to be larger installations. This is important, because it seems that these users are looking for the best deal they can find. It also shows that they are less concerned with doing business only with one manufacturer.

Money Is the Motive

Most users are motivated by the financial advantages and the high performance level of independently manufactured equipment.

IBM, CDC, and the others have no monopoly on good design or good service. If a customer feels that he is being offered a good quality product, and that he can save money in the process, he will make the change.

In the past, users would insist on a trial period where they could test out the equipment before buying it. This practice has diminished because many of the products today have been through several such test periods, have proven themselves, and other customers can check with the original customers for a reference.

Dual Maintenance No Problem

Users don't object to dealing with more than two maintenance organizations as long as they get quality service at a fair price.

Everyone calls different service companies today to work on the air conditioning, the plumbing, the TV, etc.

This is really a way of life. Why shouldn't people expect to call experts on a particular piece of equipment, and other experts on other equipment?

The way users react to the idea of dual maintenance is changing fast. Even though computers were not serviced this way originally, users are accepting the change.

Service is still the key. If the independent manufacturer can build an effective service organization, and can give the customers the service to which he is entitled and which is so necessary for computers, the remaining fears that concern customers will disappear.

What's Coming Next?

To identify future products from independent peripheral companies all one has to do is examine the current product lines of the major manufacturers — IBM, Honeywell, CDC. These are the future products users can expect from independent peripheral companies.

Luther A. Schwalm is president and chief executive officer of Management Assistance Inc.

Card Equipment Breaks Independent-Peripheral Ice

By Peter L. Briggs
CW Supplement Editor

IBM had a complete throttle-hold on card-oriented equipment for many years because it held all the relevant patents and manufactured the card-producing equipment. In 1948, IBM agreed to license its patents to other companies.

This made little or no difference for several more years, for almost everyone who was using punched-card equipment was already an IBM customer.

Univac and other companies at the time made some small inroads into IBM's market, but they were insignificant.

Key-to-Tape Broke the Ice

Then a company called Mohawk developed a key-to-tape unit. This unit seems to have broken the ice after nearly 40 years.

Within five years, nearly a hundred companies were in the unit-record business with key-to-tape and key-to-disk devices and later, data entry equipment in general.

Now over 30 companies manufacture keypunches in quantity, and dozens are making other unit-record entry devices. There seems to be a modern-day renaissance in card-oriented computing.

System/3 Sets Trend

IBM even has admitted this by the introduction of the System/3, a card-oriented computer for the 1970s.

The System/3 does indicate one particular aspect of the new card-oriented business; the customers are much smaller companies with less money to spend and less complex needs.

These smaller companies are now potential customers for the hundreds of devices now available to handle cards cheaply. Perhaps Univac will decide to take another try at the unit-record business, after its withdrawal in the early 1960s.

Modern technology makes tremendous power available cheaply and in very small packages. Minicomputers, now a major element in small systems, make it
(Continued on Page S/12)

User Relations With Manufacturers Don't Suffer With Independent Peripherals

By Frank Piasta
CW Staff Writer

The DP manager who obtains his peripherals from an independent source can probably depend on a level of maintenance at least equal to that provided by the mainframe supplier.

This was the result of several studies published recently and tested by CW's recent survey.

With very few exceptions, users judged the maintenance provided by the independents to be the result of a diligent effort on the part of the supplier to provide a high level of service.

Users said superior design in these replacement peripherals appeared responsible for much of the high reliability observed. Most users admitted that the initial period of adapting the new units to their systems was a trying experience. Many problems were encountered and solved — some of them through field engineering modifications, some through outright equipment replacement.

Some users said they felt that as soon as one trouble was solved, another cropped up. After their adjustment period, however, operations improved enough for the user to accept the equipment. It began to perform reliably - at least on a level with the mainframe maker's product, most users reported.

The large user is definitely in a better position, as far as maintenance is concerned. If his installation is large enough the peripheral manufacturer may assign a resident field engineer.

According to estimates, this requires at least 15 devices installed, although some installations with as few as ten components have been able to obtain the services of a resident engineer.

Reports show the small user is not seriously hampered. Users said the amount of preventative maintenance required for the new equipment is less than what they had come to expect from the mainframe manufacturers' equipment. In addition, when trouble did occur, the unit was frequently repaired more quickly. Users credit this improvement to the apparently simpler design of the components.

Service was markedly superior in those installations located in or near major metropolitan areas. At the present time, most manufacturers of independent peripherals have concentrated on these areas and companies in the outlying areas might have to wait until maintenance facilities can be expanded.

Third-Party Maintenance

Third-party maintenance could be a solution to some of the service problems. Third-party maintenance is maintenance support by a firm other than the equipment manufacturers. RCA Service Co. is currently servicing "mixed" installations of IBM central processors with peripherals supplied by a variety of manufacturers. Users report this arrangement seems to work quite well.

Under a new type of third-party operation — facilities management — the management firm takes responsibility for coordinating maintenance on the various manufacturers' equipment. There is little experience with the long-term success of this method, but facilities management firms are actively developing the independent peripheral companies.

New Devices From Independents

Computer Output Microfilm Shows Creative I/P Trends

By Frank Pinta
CW Staff Writer

One device that is almost exclusively the product of independent manufacturers is the computer output microfilm (COM) printer. The device puts computer output either directly onto microfilm or simultaneously prints hardcopy with an electron beam printer.

Most of the available equipment functions in one of two ways. It acts as a substitute for impact printers, because it can operate at speeds over 1,000 page/min where impact printers only run at about 1,000 line/min. These printers allow the CPU to run at full speed while producing hard copy.

The other major technique produces only microfilm output. These units are particularly valuable when there is a large volume of rarely referenced output.

The main problem with microfilm-output comes when a user tries to read it.

Special reading and display equipment must be purchased. This limits the use to very large applications, most users say.

The other principal use of COM has been to capture on film the output of CRT displays. These are used most often in scientific applications where vector displays, polar plots, and other graphical outputs must be recorded. Another use is in the field of graphic typesetting where the CRT is used for composition of printed matter.

Special viewing devices are needed here, too. Since the output is transient, photographic film is the only practical solution in common use. Video tape has been used experimentally, but it still is not deemed economical.

In COM, the major computer manufacturers have not been dominant. Indeed, excepting RCA, the big companies have ventured very little, leaving the field to firms that have more or less specialized in this area.

Examples of COM

There are two principal types of COM devices: those with a self-contained computer, and those that are attached to an outside CPU to perform their processing.

An example of the latter category would be the Kodak KOM-90. Selling for about $116,000, it has the power to process up to 300 page/min.

The former is exemplified by the Betacom 600, which contains its own computer. Priced at $125,000, it can process up to 600 page/min. All software is provided by Beta Instruments.

The $50,000 Memorex 1600 is judged by industry sources to be highly original. It uses photodiodes and fiberoptic strands to capture and transmit images.

Maintenance, long thought to be a major problem with COM devices, is said to be reduced to almost nothing. However, the same sources, that admire this unit's technology say that the quality of the output is marginal, and its severe connection limitations discourage most users.

Another type of device is the 3M Electron Beam Recorder, priced at $105,000.

Through the use of special processing techniques, it achieves some of the highest throughput rates currently available. Combining an extremely fast frame advance with a technique which eliminates the CRT completely, the unit is capable of producing from 120 to 900 page/min.

The time for vector plotting is equally impressive at 150 µsec/in. The CRT is bypassed by having the image fall directly on the film.

The Model 7000 from Computer Microimage Systems is another fast unit, being able to produce from 27 to 900 page/min. Priced at $110,000, the unit has an internal processor. Capable of using a wide variety of input tapes, it can be used either on-line or off-line. Described by industry experts as fast and versatile, the software support has editing capabilities, including tabbing and spacing.

Mainframe Companies Involved

What might be the precursor of things to come was revealed when IBM's Federal Systems Division demonstrated an IBM 4481 Film Reader Recorder. This device, using 35 mm film, not only produces images, it can read them too. The device uses a CRT to direct light through a lens at a transparency or unexposed film. The beam can be directed at any of 16.7 million points, a 4,096 by 4,096 matrix. Compatible with Models 30, 40, 44, and 50 of the 360 series, it is priced at $250,000.

With the exception of the IBM unit, most COM devices are usable out using 10 mm, 35 mm and 105 mm (microfiche) film for output.

Some Large Users

Industries with light demands for access to large stores of information have been the best customers for COM devices. The aircraft and automobile industries, with their extensive parts catalogs, have been large-scale users. The stock brokerage houses have used COM to relieve some of the pressures on their perpetually overloaded back offices. The Weather Bureau, too, has been among the early users to store data.

"There goes the neighborhood!"

Optical Character Readers Still Made by Independents

By Peter L. Briggs
CW Supplement Editor

Optical character recognition equipment has been one of the oldest independently sold types of peripheral equipment. The most often heard about company is probably Recognition Equipment Corp, the main developer of pattern recognition optical scanners and optical systems.

Originally, optical character recognition was severely limited. Numeric information, and only then if it was in a carefully selected format, was the only type of data that these early readers could handle.

IBM, CDC, and other manufacturers have since gotten into optical scanning. Recently, IBM announced and delivered the 1287 Alphanumeric Optical Reader. Shortly before that, a company called Compuscan of Leonis, N.J., announced the completion of a scanner that would read any font, and could be taught fonts it didn't know.

The last two years have been a time of complete chaos for optical scanning. Huge volume, limited character sets, and little flexibility are being replaced by applications demanding software-controllable highly flexible equipment at a reasonable price.

Type Fonts Cause Argument

There has been a battle over type fonts. Two major factions exist: one proposing the modification of the existing unreadable (to people) character set (OCR-A); the other advocating a character set that matches humanneeds better (OCR-B).

Users have complained that the points these people are arguing over are purely academic. What users say they need is a machine that will read ordinary typed documents with a high degree of accuracy. Many users think that the only purpose to this argument is to promote more business by locking users into some particular character set and manufacturer.

Compuscan Solution

The Compuscan reader appears to offer this kind of capability, and it seems to be the only one of its type around. The principle is simple; when the machine reads a character it doesn't know, it displays the character for the operator who then types the alphabetic or special character equivalent. The machine then stores the translation for future reference.

This way, any type font or character style in use could be read, easily satisfying the major user complaint.

The demand for software has been based on the need to accept several mixed document formats and to interpret these documents readily.

When the decoding logic is wired into the hardware, changing documents can be very complex and costly. Normal applications, such as sales recording, warehouse control, and inventory ordering cannot conform to

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Attention mini computers.

No mini computer has ever enjoyed choosing a printer.

Mainly because there have never been any appropriate printers to choose *from.*

On the one hand, there were little typewriter-type printers that were much too slow for high-speed mini computers.

And on the other hand, there were big superspeed printers that were designed for big superspeed computers. And they were much too expensive for mini computers.

Those were the choices.

And if the mini computer didn't like it, it was "Sorry, pal, take it or leave it."

Not much fun.

So if you're a mini computer, you'll . . be glad to know there is now a printer that was designed specifically for you.

It's not too slow. It's not too expensive. It's exactly right.

So rejoice, mini computers. Rejoice.

Nortec's mini line printer.

Nortec 200 is 132 columns, prints at 200 lines per minute, produces crisp type on up to 6 copies. The entire unit, with all electronics including buffer controller, ready for direct hookup to computer, is as little as $6000 in OEM quantities. It's just a little larger than an electric typewriter. The $6000 price includes these standard features: IBM-compatible vertical format unit, front-opening yoke assembly for easier forms loading and ribbon changing, self-test feature for testing electronics and mechanism. Nortec Computer Devices Inc., a Consumer + Technical Company, Ashland, Mass. 01721, (617) 881-3160.

Punched Card Units Break IBM's Market

possible to use much less sophisticated peripheral equipment in small sites.

Service costs for this equipment are quoted at far lower prices than IBM's because this modern equipment uses electronic circuitry, is far more reliable, and can do more things without the mechanical problems of, for example, the IBM 407 Accounting Machine.

The System/3 does introduce a monkey wrench in the form of a 96-column card. Large numbers of first-time users are not the least unhappy about 96-column cards because they never had 80-column cards. This user reaction might force other companies to re-invest all the development money they had spent getting compatible with IBM's 80-column equipment.

Threat Or Benefit?

This will represent a problem for future users, because the System/3, an IBM product sold by IBM's sales force, automatically sets a new industry standard.

Presumably, IBM will make the System/3 compatible at the RPG-II level at least, with the upcoming fourth generation. Compatibility could present users with a unique opportunity, the ability to convert programs without any difficulty. System/3 users know nothing about assembler languages or machine language.

System/3 users will have no commitment to such outmoded ways of programming, and will avoid conversion almost entirely. Other companies are now following IBM's lead. Independent peripheral equipment for the System/3 is now available from several companies and more is promised within the next few months.

System/3 users will probably be able to take advantage of the largest concentration of technological horsepower ever concentrated on a single computer – all to provide them with competitive equipment.

Honeywell delivers Keytape.* No excuses.

We know how eager people can be to get their new Honeywell Keytape equipment.

It's the kind of enthusiasm we expect. After all, consider the advantages that Keytape data preparation has over keypunching.

Benefits like faster, more accurate data transcription. Faster data input to the computer. Reduced operating expense. Simple error correction. Improved storage and handling. Lower noise level. Happier operators.

You can also do a lot of things with Keytape that you could never do with Keypunch. Things like communicating to remote locations, printing out hard copy, converting cards or paper tape, pooling data from multiple units, validating check digits, adding and listing. Altogether we have 52 different models in both seven-channel and nine-channel configurations.

So if you're in a hurry to get your Keytape equipment, we understand. That's why we deliver. Fast.

Even if it means a little extra effort on our part.

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The Other Computer Company:
Honeywell

Independents Benefit Users

Independent User Has More Leverage on Manufacturer

By Frank Piasta
CW Staff Writer

By using independently manufactured peripherals, a user can actually place himself in a stronger position with his mainframe manufacturer.

Because of vendor competition it is now possible for users to negotiate the terms of a contract, terms which previously had been pretty much frozen. Vendors are now being forced to offer quantity discounts, special maintenance arrangements, and cancellation privileges.

Finding that the services supplied by his mainframe vendor did not deteriorate after the installation of independent equipment, a user is more willing to apply pressure to the mainframe source. He can force mainframe manufacturers to negotiate secure in the knowledge that he could fall back on independent sources for even more of his peripherals.

Users have reported that the introduction of an element of choice into the acquisition of computing equipment has been of great help in uprooting the psychology of single-source purchasing.

The new options open to a user enable him to apply the kind of purchasing techniques that are standard for most other industries. He can evaluate equipment based on performance and economics. He has the leverage to a "take it or leave it basis" with the mainframe manufacturer. The only thing he felt he could do was, to replace the entire system with a competitive one. This would be done only under extreme circumstances, due to the expense and risk involved.

The DP system is no longer treated as an entity, but as a system made up of several parts, each receiving attention. If the user continues to buy from one source, it is no longer because he didn't have any choice.

This was not the case previously. The user was pretty much on a "take it or leave it basis" with the mainframe manufacturer. The only thing he felt he could do was, to replace the entire system with a competitive one. This would be done only under extreme circumstances, due to the expense and risk involved.

Now, the user can threaten the supplier with the loss of a part of the business and safely be able to carry out the threat. Users report that this advantage has given them much greater leverage in dealing with uncooperative vendors.

The adoption, on the part of the user, of a stronger posture with the mainframe supplier has not been detrimental.

Users have reported that relations with their CPU suppliers have been no worse than before the independent equipment was installed. In some cases, there seemed to be an improvement. The level was maintained at some installations because of pressure from the installation management.

Even in cases where the system supplier mounted a rather extensive campaign against the outside equipment, cooperation continued after the outside equipment was chosen.

Industry sources have speculated that this might be a direct result of the user's revealing himself to one company and so willing to go in search of the best values from various sources.

An indirect benefit to the user is that the presence of competitive devices sometimes makes the mainframe vendor's product look inferior. This could result in a more competitive climate in which the ultimate victor would be the user, the reward being a wider choice of better equipment and services.

Until the installation of another manufacturer's products in his site, the user can rely only on specifications and opinions for relative performance of his own

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IBM's 1287 Shifts Users Towards IBM

a single document style or format.

Document Flexibility Required

The entire document must be read, and this requires a high degree of flexibility in scanning and character positioning. This need is intensified by the need to read hand printing.

Very few applications can be easily converted to a machine-printed document. The warehouse foreman cannot carry a recorder around that prints out special documents on demand, The sales clerk in a department store needs to be able to prepare sales slips immediately; this necessitates hand printing.

The Compuscan reader can be taught to read hand printing, as does the IBM 1287.

There are severe limitations, One large retailer using optical readers to process sales documents has instituted a special bonus plan for employees who can maintain minimum rejection rates for their sales documents.

Cost Must Be Reduced

Users say that the tolerences for reading must be expanded greatly concurrent with a lowering of the basic cost of optical scanners.

Scanners currently cost in the vicinity of $1 million, with a top figure of nearly $2 million for larger systems from Recognition Equipment. It it were possible to get the rental on such equipment under, say, $1,000/mo for full-scale scanning systems with the ability to read hand printing, there would be a tremendous surge in the use of such systems, users say.

CalComp puts the sun out in 3.1 minutes flat.

It's not doomsday, exactly, but it's almost as weird.

What you're looking at is a *drawing* of what a radio telescope sees when it looks at the sun.

A computer-controlled CalComp 835 plotter drew it on microfilm for The Aerospace Corporation in Los Angeles.

The people at Aerospace need a large quantity of sun complexion maps like this one for their study of the sun's radio burst mechanism.

And by using our 835 plotter, they get them fast.

In fact, the 835 can draw at a rate of 100,000 plot increments a second. Because it draws with modulated light. On microfilm.

(With a choice of five fully automatic microfilm camera options.)

What's more, CalComp microfilm drawings can be viewed separately, like ink and paper drawings.

Or in sequence for time-lapse motion picture studies.

CalComp is the leader in computer graphics.

With sales, service and software in 58 cities. And the greatest variety of plotters in the world.

Including compact drum plotters. Giant flatbed plotters. And in our 800 series, plotters that draw not only on microfilm, but on microfilm *and* paper.

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He can help you with just about any graphic problem under the sun. Including the sun.

Independent Peripherals Make Sense for All Users

By Peter L. Briggs
CW Supplement Editor

It now makes sense for almost any size or type of computer user to investigate and use independently manufactured peripheral devices, according to all reports and user comments.

The main trade-offs come under the heading of economies of scale.

If an installation can afford to purchase its peripherals and can effectively justify their use for several years, then truly enormous savings are available.

For the user who continues to lease or rent his equipment, the savings are more modest but still considerable.

When new types of independent equipment first came onto the market, there was justification for caution and lengthy testing. This is no longer the case because most independent equipment has proven itself to be the equal of the equipment it replaces.

As the market for peripheral equipment tapers off with the introduction of large-capacity internal memories, IBM and the other major manufacturers will certainly reduce the pressure on its users, and eventually will not even protest when .non-CPU-manufacturer equipment is installed around the CPU.

With the major push towards software sales, particularly from IBM, there is evidence of a trend away from peripherals·as the main source of manufacturer revenue.

Currently, most installations spend nearly twice as much on peripheral equipment as they do on the .central processor. Installations are also spending twice as much for software as they are for all their hardware.

Standardization Opens Doors

The trend to standardize hardware interfaces and provide compatibility among a given generation of computers has opened the .door to more and more different types of peripheral equipment.

Plotters, audio response, communications equipment, and many other areas of computer equipment are concentrated outside the manufacturer.

The little IBM 1130 installation could easily be using Cal-Comp plotters, the SYS Associates' communications interface, MAI disks, and someone else's high-speed printer.

Causes for Delays

Why should only the smaller installations feel free to use independent equipment?

In many cases installation politics have interfered, prodded on by the mainframe manufacturer. Fears of inadequate this-or-that, loss of manufacturer support, and loss of face have slowed down what should have been a massive jump into less expensive equipment.

IBM Partly at Fault

IBM's past tactics ˙may have caused users·to become cautious. After the headlong rush into computers over the past 10 years, many users feel wary of all claims.

Users are perhaps tired of being left in the lurch because the manufacturer was unable or unwilling to deliver on his promises.

National service companies are picking up this new equipment and servicing it. These companies are as qualified as IBM, for example,˙to maintain tape drives or disks. In many cases they were formed by ·ex-IBM customer engineers and management, and can offer tar less expensive maintenance than can IBM with its high overhead.

The majority of the largest computer installations in the country have brought in some independent peripherals to replace those of the CPU manufacturer. It is simple to ignore this by saying, "They can afford the risk, and they are such large accounts that the companies will service them better."

This is certainly true. However, the independent peripheral service companies are servicing the equipment·no more and no less thoroughly than IBM's customer engineers used to. IBM would place full-time CEs at any sufficiently large site. Remote geographical locations suffer under IBM, Honeywell, Univac, and every other company that must operate under the economies of making a profit.

Large companies like IBM can, of course, afford to offer service in areas where smaller companies cannot, simply because of the size of the customer base. Fairbanks, Alaska, not a bustling

Independents Offer Users Longer Tests

equipment. Once the outside peripheral is installed, he can perform his own analysis based on a side-by-side comparison.

Throughput, ease of maintenance, reliability, and simplicity of design can be easily compared. Most meaningful to the user is the familiarity of the environment under which the test is being conducted. The results of the test are the·results he probably can achieve.

The attitude prevailing among peripherals vendors makes this possible. Usually they will cooperate, in longer-than-normal equipment trials, and so give the prospective user a better chance to evaluate the device.

Such a long equipment test period also can allow the user to evaluate another factor for the first time, the quality of maintenance personnel supplied by the competing manufacturers. While it is true that the independent manufacturer would be doing his utmost to keep·things going smoothly, it is also probable that the system maker would not want to come off "second-best" by comparison and would also reinforce his support.

The advent of the independent peripheral is helping to make the computer industry into more of a buyer's market, where he can have a much greater degree of flexibility and freedom than he has ever before enjoyed.

Picky processor?

CPU's get mighty picky on a paltry diet of proverbial punched cards.

That's why Inforex developed Intelligent Key Entry.™

Inforex feeds hungry CPU's. It does electronically what other forms of data entry do mechanically.

The Inforex system gathers data from eight keyboards into one disc memory unit. Data may be sight or key verified. Built-in logic performs check digits, left-zeros and balance totalling. Jobs are pooled onto 7 or 9-track compatible tape. Optionally, it will operate on-line directly to your central processor.

Keypunch/verifier functions. Starting with the familiar 64-character keyboard, each Inforex keystation performs all keypunch and verifier functions: Automatic check-digit computation. Automatic left zeros. No digit by digit keying is necessary. Electronic skipping and duplicating rather than mechanical. Auxiliary duplication or two additional levels of program control. Automatic + or − signing of fields.

Simultaneous entry and verification. All eight keystations input to one disc memory unit. Each keystation is assigned an area as it enters. Any keystation can access any assigned area at any time.

Since each keystation has both sight and key verification capability, one keystation can verify work entered on another and if desired, verification can be done simultaneously with data entry.

Keyboard to tape functions. Inforex automatically pools input from up to eight keystations onto 7 or 9-track compatible tape. One easily entered statement transfers a series of batches. Only one keystation is required to initiate the transfer, and all keystations are functional during transfer. There are no cartridges to handle or identify, no special equipment needed for pooling.

Recallable programs. Each program has four levels of control. Once the program is keyed, it can be stored for future use and recalled by any operator merely by keying its appropriate program name. Up to 128 different program controls can be stored. There's no program card or tape mounting and no repetitive program control keying.

Self-balancing. Zero balancing is an integral part of the Inforex system. Each operator may accumulate a control total during data entry. Edit controls allow rapid correction. Adjustments to the balance total occur automatically during verification.

128-character records. With Inforex Intelligent Key Entry, the record length is variable up to 128 characters.

Full record display. For added accuracy, each keystation displays an entire 128-character record with moving cursor and position counter. The system has a forms capability that allows data entry and verification in a "fill-in-the-blank" fashion. Operator messages for direct interaction with the system along with search and paging of a file are standard.

Attractive office decor. Inforex design innovation doesn't stop with the components. Each Inforex keystation is built into an attractive contemporary walnut and black steel desk designed for operator ease and comfort. And remember, the system is electronic, not mechanical, allowing a quiet, comfortable atmosphere to work in.

Inforex monthly rental cost is $50 per keystation. $560 for control unit (up to 8 keystations). $960 for a complete 8 keystation system, including maintenance.

Inforex, Inc., 21 North Avenue, Burlington, Mass. 01803 or, Inforex AG, Dornacherstrasse 210, Basel, Switzerland.

"Inforex it."

New Large Memories May Wipe Out Tapes, Disks, Etc.

By Peter L. Briggs
CW Supplement Editor

Until recently, most of the special types of external storage devices, like the laser memories, giant drums, semiconductor memories, etc. were exclusively the property of the independent manufacturer. IBM usurped this prerogative by presenting a paper on the development of its working optical memory/holographic storage system.

Many devices were developed for a specific type of computer. Examples include the Fastrand memory for the Univac 1108, the special semiconductor memory for the Illiac4V system, and the Race units for the large-scale GE systems.

Immediacy Breeds More Devices

As users clamor for larger and faster external storage devices, many electronics companies, including new companies formed just for this purpose, have developed new memory storage devices.

The list grows daily, with Ampex, Precision Instruments, Cambridge Memories, Lockheed, and Bell Labs either delivering or developing large-capacity external memories.

Types Available

The basic types of existing large-capacity memories are:
• Laser-driven recording memory, represented by Foto-Mem, Precision Instruments, and Ampex.
• Holographic memories, storing data on holograms, represented only by IBM at the moment.
• Semiconductor storage devices, represented only by Advanced Memory Systems at present but with many others furiously being developed.
• Fixed-disks and drums, represented by Bryant Computer, Vermont Research, and other firms of long-standing reputation but little exposure.
• Specialty memories, represented by the GE Race, the Univac Fastrand, and the IBM Datacell.

The capacities of these memories range from a few hundred-thousand characters, such as the Vermont Research drums, to a trillion characters in the Precision Instrument's Unicon 690.

How They Operate

For some reason, the laser-powered recording memories and the IBM Datacell were developed along the same principles. Both types of device store information on strips of material that are stored in cells and retrieved by a set of plucking fingers that would do justice to a Rube Goldberg Apple-Picking Automata.

The GE Race keeps a stack of magnetically recorded cards moving along a path within the machine. To retrieve data, the appropriate card must come under a read head. These cards however, travel at many ft/sec, and occasionally jam up, causing the eruption of a small volcano of cards.

The big drums and fixed disks work on the same principle as the IBM 2311 and the Honeywell 273, and are just larger, or faster.

Semiconductor memories are intended to replace core memories. Information is stored in patterns of pre-set semiconductor switches, and the information can be read without being rewritten, as it must be with core memories.

These memories can be used either as very high-speed external storage memories or as built-in memories in central processors.

The true laser-holographic memory stores data on holograms and reads the data with a laser beam. These memories could operate at the speed of light, far faster than is possible with any electronic or core memory. Memory speeds are expected to reach as low as 10 to 15 nsec for random access.

With the introduction of the IBM Large-Capacity Store, essentially an external core memory that can be attached to the larger 360s, other companies began examining the use of such devices as peripherals.

Lockheed developed one both faster and cheaper than IBM's. These memories represent the greatest difficulties for attachment to the central processor because the core memory is addressed in the same manner as ordinary internal memory and must be connected directly into the addressing circuitry.

Only the 360 provides a plug-to-plug compatibility capability for such memories at present.

Why Are Large Memories Used?

According to current users of large-capacity memories, the basic need is for on-line applications where data bases must be accessed and updated constantly. Secondary applications include enormous master files, like the one used with Nasa launchings.

Of these various types of large memories, only the IBM holographic memory and the semiconductor memories offer much promise for the future, according to industry observers. Both of these memories can offer sufficiently fast access and sufficiently large capacity to be economical for most applications.

Cost presents the major drawback. Current core memories are sold for about 3 or 4 cent/bit. With advanced production technology, the price might go down to about 1 cent/bit.

Semiconductor memories offer

I/P Equipment Is Economical For All Users

center for the data processing industry, can support an IBM customer engineering group, a Honeywell engineering group, and one or two representatives from other large companies.

The only thing that will change this situation is the increase in sales in remote locations for these smaller companies. If enough customers are available, then the company will service any equipment.

Reports Show That I/Ps Offer From 20 to 60% Savings

By Frank Piasta
CW Staff Writer

Most users can save significant amounts of money if they switch to independent tape and disk drives, according to several studies conducted recently.

One of these studies, performed by the Diebold Group, cited a $6 million saving by "the holdest pioneer, a West Coast utility company that has purchased 220 tape drives."

The Diebold study concerned itself primarily with installations that "replaced IBM units with comparable products of independent manufacturers.

Savings ranged from about 20% under leases to as much as 60% under purchase arrangements, according to Diebold.

Another study, conducted by

the Government Accounting Office (GAO), was made because "preliminary indications had shown that significant savings could be achieved in the procurement of selected computer components."

The GAO study recommended "that the head of each federal agency take immediate . . . steps [to replace] leased components with more economical plug-compatible units."

Both studies focused on two basic components of computer systems — tape and disk drives. The Diebold report centered on experiences of users. All of the users represented in these studies obtained their equipment from two suppliers, MAI and Telex.

MAI, at the present time, is

said to be the largest supplier of independent peripherals. Industry sources estimate that 60% of the compatible peripherals_is sold through MAI, a third party leasing and marketing firm.

Telex, accounting for an estimated 35% of the business, manufactures some of the equipment it sells, but relies on other manufacturers for the balance of its line.

Some of these firms that built peripherals for computer manufacturers, and that more recently have supplied units to MAI and Telex, have decided to market their products directly to the user. In this group are Ampex, Potter, and Memorex.

Ampex, until a little over a year ago, built its equipment exclusively for major manufac-

turers. It now has added direct end-user sales.

R.L. Slover, marketing manager for Ampex, describes his company as being in the business of trying to show people how to save money. In keeping with this policy, Ampex says that its magnetic tape drives are priced to save the user 20% to 30% over IBM rental prices for comparable products.

Ampex claims_that its prices for outright purchases would represent an even greater savings to the user, amounting to 40% to 60%, but Ampex declines, as a matter of marketing policy, to disclose the exact prices of its equipment.

Potter Instrument Co. has also been manufacturing peripherals for the OEM market, selling its

products to CPU makers and, more recently, through MAI.

An industry source estimated that there are about 2,000 Potter tape drives bearing the MAI label connected to IBM 360s. Since November 1969, Potter, too, has entered the end-user market. Prices released by Potter show that significant savings could be achieved over IBM prices.

Typical Savings

For example, in disk drives the Potter DD4311 drive carries a lease price of $450/month, including maintenance, and sells for $18,100. Potter charges $50/month for maintenance of the purchased drives.

The IBM 2311, the plug-to-plug equivalent of the DD4311, rents for $570/month, including maintenance, and carries a price tag of $24,745. IBM charges $55/month for maintenance.

The IBM 2314 disk storage system, consisting of a controller and nine disk drives, rents for $5,250/month. Purchase price of the system is $237,105 plus $615/month for maintenance.

An equivalent system, composed of nine Potter DD4314 disk drives and a DC5314 controller, carries a rental of $4,640/month, and a purchase price of $235,000. Maintenance of the purchased units would add $505/month to the purchase cost.

Potter offers seven tape drives, three compatible with the IBM 729 series, and four models compatible with the IBM 2400 series.

To illustrate the price dif-

Tapes, Disks May Not Be Needed Soon

a potential cost of about 1/4 cent/bit as well as rapid access (in the 25-100 nsec range).

Holographic storage represents a tremendous cost saving with a possible cost of about one-thousandth of a cent/bit or less.
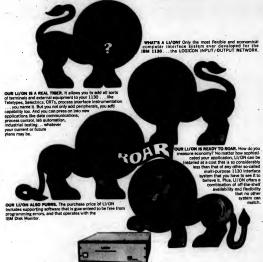
The need for enormous data bases has been increasing rapidly in the last three or four years. More and more companies are developing some form of management information system and these systems have a requirement for huge on-line data storage.

The nature of current peripheral equipment, with its inherent awkwardness and mechanical unreliability, place more and more emphasis on the need for a better idea in data storage.

Holographic memories have no moving parts, can be made as large as might be desired (several trillion characters is not unreasonable — more data than is currently in existence on computers in the entire world), and are very inexpensive.

With a sufficiently large internal memory, there would simply be no further need for external peripheral storage devices. The only remaining need would be for input or output.

The Government Viewpoint

Government Agencies Can't Agree on I/P Usefulness

By Drake Lundell
CW New York Bureau

The results of government experiments on the feasibility of purchasing peripheral equipment separately from central processing units in large computer systems will affect government and non-government computer users' buying habits over the next few years.

The experiments will be conducted on some large government contracts within the next two years and are designed to answer the questions that plague computer users forced to choose between peripheral equipment from mainframe manufacturers or from independent manufacturers.

The major question to be answered is one of costs. Is it actually cheaper to buy a tape drive (or disk drive, etc.) at a lower initial purchase price than to purchase the higher cost unit from the manufacturer?

But to answer that question, the government researchers will have to decide a host of associated points:

• Is the independently manufactured equipment as reliable or as good?

• Who will assume the overall maintenance responsibility in such mixed systems?

• Will compatible hardware also be software compatible?

• Is the cost of interfacing disparate equipment worth the reduced equipment rentals?

WWMCCS First Test

The first major test of the separate procurement idea was scheduled to be made during the second phase of the development of a World-

Wide Military Command and Control System (WWMCCS), which is being handled by the Air Force although it is a combined effort of the major services.

This project, which could eventually involve as many as 84 complete computer systems, has been in the works for several years, but is now apparently stalled. Recently the Air Force withdrew a request for proposals for the system within a week of the date it was to be issued.

Some observers feel that the project, one of the most ambitious undertaken by the combined services in the computer field, has been dumped due to budgetary cuts and interservice rivalry.

But, whether or not the WWMCCS project fades into the background, the government will continue its experiments into the feasibility of separate purchases of peripheral equipment and central processors, spokesmen indicated.

GSA Does Studies

The General Services Administration (GSA), which reviews all government computer contracts, has promised such an experiment for the past two years and will not drop the project even if WWMCCS is torpedoed, agency sources said. If the WWMCCS experiment is delayed, it is felt that another, possibly smaller

project will be used to test the idea, they added.

While there is no official government position on the feasibility of separate procurement, previous government reports and some limited tests indicate the promises and pitfalls involved in buying equipment from more than one manufacturer.

The major problem expected in separate procurement is that of maintenance for the overall computer system. A previous GSA-sponsored study of the maintenance services available in the computer industry indicated minimal difficulties with dual maintenance.

The study reported that many computer manufacturers would

not take overall system responsibility for computer systems that contained independent equipment, i.e., equipment manufactured by other firms. The report also said that there were very few national "third-party" maintenance firms servicing the computer industry at the time, and little help could be expected from outside consultants.

In addition, the GSA study team found that many large government computer users were becoming disenchanted with in-house maintenance services because of high costs and unsatisfactory service. In fact, the study said that the number of sites using in-house maintenance

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User Savings Up to 60% Are Shown

ferences, one model each of the second and third generation devices reveal these comparisons.

• The IBM 729-4 can, according to Potter, be replaced with the Potter SC7294.

The IBM unit rents for $875/month. The purchase price is $40,000, with maintenance charges of $109/month. The Potter unit would cost the user $18,500, plus $90/month for maintenance, or $700/month on a lease.

• In third generation equipment, Potter offers the SC2403 as a direct replacement for the IBM 2401-3.

The Potter device would cost the user $530/month on a lease, or $21,100 plus $90/month maintenance, on a purchase basis. The IBM unit rents for $785/month and is sold at $35,660. IBM charges $86/month for maintaining this drive.

These prices do not represent the total spectrum of the manufacturers of independent peripherals, but they do illustrate facts that underlie both the GAO and Diebold reports.

I/P Users Put More Pressure on Major Manufacturers

By W.P. Sharpe
Special to Computerworld

It wasn't too long ago that independent peripherals did not exist. The idea of putting independent peripherals (I/P) on a computer system manufactured by IBM was unheard of.

Fortunately, for both the peripheral equipment manufacturer and for the data processing user, that picture is rapidly changing. A whole new industry has appeared.

Before we get into the specifics of the economics involved, it is interesting to look at what has brought about this change. Basically it involves experience and costs.

In the early years of data processing it was customary for the computer users to select a single major computer manufacturer.

Once selected, the manufacturer determined the equipment requirements for the applications and supplied the software to make the system operate.

The reason for this total dependence was that few people other than computer manufacturers knew very much about data processing. As a result, a manufacturer's word was law. The data processing manager operated the system supplied to him without worrying about individual items of equipment.

Today, the systems manager has become increasingly knowledgeable and sophisticated. He is now competent to evaluate equipment performance. His efforts have led him to the discovery of I/P devices specifically designed to provide better performance at lower cost when used in conjunction with a major manufacturer's mainframe.

With 3,000 independent tape drives and a great number of disk drives operating on IBM systems throughout the country, independent equipment is now an attractive reality.

What I/P Offers

Independent peripheral manufacturers have to offer the user something to persuade him to try the equipment.

That something turns out to be performance and low cost. The job of the independent manufacturer has been made easier by the fact of his specialization.

Consider the major computer manufacturer and the tremendous task that he has to develop

a mainframe and extremely broad range of peripherals and a huge amount of software support that is necessary to make the product useful.

The size of the job prohibits him from putting emphasis on any one, two, or three peripheral devices. The independent, interested only in producing a device

Government Agencies Disagree on I/P Use

was dropping, and that very few were even considering it among the other approaches open.

So, the study said, the user with a mixed computer system was faced with three basically unsatisfactory approaches for

handling his maintenance services. The proposed new study will try to find a solution to that problem.

Costs Estimated

While the GSA was finding problems with the maintenance

of mixed computer systems, another agency, the General Accounting Office (GAO), was pushing the use of independently manufactured equipment as a method of reducing the government's data processing cost.

In a report to Congress, the GAO, often called the government "watchdog" agency insisted that the use of independent equipment could save the government, which is the world's largest computer user, millions each year and pointed to businesses that were saving up to $100,000 each year through the use of such equipment.

Government researchers also found that it was sometimes hard to tell whether the independent would be compatible with the "parent" system, especially with equipment that was not "plug-to-plug" compatible. In such cases, GAO said, the cost of programming a system to accept equipment manufactured by an independent far outweighed the savings realized through reduced purchase prices or rentals.

In such cases, the study found, it was often best to sign a contract calling for the independent to develop the software to make his equipment work in the existing environment. Often the independents would undertake this responsibility, thus relieving the user of the problems involved, GAO said.

The government and most other computer users have not made a firm decision on the value of purchasing the components of a computer system from more than one manufacturer. The upcoming test procurements by the GSA could answer many of the questions in this area.

If the study finds some way to overcome the problem of maintaining computer systems made up of parts from more than one manufacturer, it may point the way for future computer procurements both within and outside the government. The effects of such a massive change in procurement policies will be felt throughout the industry.

Such a change would be a boost to the independent peripheral manufacturer, who could expect a vastly expanded market for his wares. For years, independent manufacturers have been fighting the mainframe manufacturers with lower priced products. If the maintenance problems can be solved, these products would be able to gain a wider market.

The user would also benefit because he would have a wider selection of equipment when developing a computer system.

COMPUTERWORLD
ON THE LIGHTER SIDE

"In the interest of economy – do you have this unit in a stripped down model without the chrome trim?"

"And now on behalf of the manufacturer, may we wish you all happiness and success with your new unit and may it save you a bundle."

"Yes, it sure is a neat, uncluttered design – so neat and uncluttered I can't find where to turn it on or plug it in!"

Peripheral Interface Standard Seen as Next Big Trend

By Drake Lundell
CW New York Bureau

Within the next few years, the federal government may force the computer industry to accept a standard for interfacing peripheral equipment with central processors if the industry does not develop a standard peripheral interface voluntarily.

The need for a standard for connecting peripheral equipment from various manufacturers with central processors manufactured by other firms has long been recognized in the computer industry. Attempts at standardization have been made sporadically over the past few years. Today, there still is no recognized standard.

There is, however, a growing interest in standardization within the government and among private users, both of which see a standard interface as a method of widening their options when making equipment decisions for computer systems.

With a standard, users claim they could choose equipment from more than one mainframe manufacturer or from among many independent peripheral equipment manufacturers when developing or upgrading existing computer systems.

The major voluntary efforts at standardization have been undertaken by the American National Standards Institute's Committee X3 on Computers and Information Processing through its subcommittee, X3.9 on interface standards. (Ansi was formerly known as the U.S.A. Standards Institute.)

Bureaucrats Say Effort Too Slow

Many government sources interested in this effort feel that the Ansi group, has been too slow developing meaningful standards in this and other areas. Dr. Herbert R.J. Grosch, director of the computer center at the National Bureau of Standards, has been particularly vocal in his criticism of the Ansi efforts.

In recent speeches Grosch has noted that Ansi has accomplished little in the area of standardization and has questioned whether the establishment of voluntary standards by the organization could ever prove worthwhile. In Grosch's view the organization is dominated by the large manufacturer, and the small user, the ultimate consumer in this case, cannot afford to participate in the Ansi sessions.

The record supports the Grosch view of the Business Equipment Manufacturers Association- (Bema) sponsored standardization effort (Ansi).

In the area of peripheral standards, the group has just recently developed a schedule for the development of functional electrical and physical channel I/O interface standards and is just now developing a schedule for device interface standards which will be discussed at a meeting this April.

No existing standards really meet the problem of the diverse interfaces among the peripheral equipment of various computer manufacturers and the equip-

I/P Users Put More Pressure On Computer Manufacturers

that will interconnect with an existing system, can put all of his efforts into making a better product.

The independent doesn't have all of the enormous software costs of the mainframe manufacturer so all of the customer's dollars go into hardware.

The emphasis of the independent has not only brought about better peripherals, but new products which do more for the end-user.

When it comes to new product development, the major computer manufacturer has to consider not only the product it wants to sell, but also the impact of new products on the sales of old products out on rental.

If the new product price or performance is too good, the old product won't stay sold.

Manufacturers Pressured

A good example of this situation can be seen in the replacement of pinch rollers by tape drives with a single capstan system. This was the work of the independent manufacturer and was followed only much later by the mainframe manufacturer. Meanwhile, I/P users receive the benefits of longer tape life, quieter operation, and easier tape handling.

In each of the peripherals brought out by independent manufacturers, the user has gained a better system performance because of the extra features and functions that became standard on the I/P equipment.

For instance, disk drives made by independent manufacturers that are comparable to the IBM 2311s and 2314s typically give better access times and better starting and stopping times. This means faster program runs and more output in a given time. And the user gets the benefit of a lower price.

Resulting Service Improvements

A benefit that has come as a surprise to users of I/P is improved service. Initially data processors feared that service on both the computer and peripherals would suffer.

Everyone just assumed that each customer engineer would blame the other's equipment for any system downtime. It has turned out exactly opposite.

The economics of I/P becomes relatively simple. The independent manufacturers, by specializing in one, two, or three product areas and by using the latest technological advances have produced peripherals which cost less and perform better than anything ever before available. They offer better system performance,

greater system output and a much better system cost/performance picture.

The author is marketing vice-president of Potter Instrument Co., Inc.

It Had To Happen

A Consultant's Viewpoint

When Should Users Install I/P? With a New System

By J. Burt Totaro
Special to Computerworld

Plug-to-plug compatible I/O devices, such as magnetic tape drives, disk drives, and line printers, are being offered with increasing frequency for use with the computer systems of the Big Eight (Big Ten?) mainframe manufacturers.

These independent devices are generally selected for lower cost, better performance, better delivery, higher reliability, more customization, and other advantages related to system design (such as off-line printing from magnetic tape).

Installation timing is important, maybe even critical, to the eventual success of these I/P devices. There is a "right time" to install independent devices, and that time is when a new computer system is installed.

The right time to install remote terminals is whenever a new application is being installed that can effectively and economically make use of such terminals. The timing, in other words, need not be related in any way to the installation date of the new computer system.

A new computer system can be installed for a variety of reasons. For example, the new computer can represent a company's first computer, a more powerful replacement supplied by the same manufacturer as the computer being replaced, a major switch from one manufacturer's equipment to another, or an additional computer to assist others currently installed.

In any case, installation of a new computer system can be the most advantageous time to order and install plug-for-plug compatible independent devices.

Complete Agreement Lacking

Not everyone agrees with this line of reasoning. Reactions to it have ranged from surprise to incredulity, to mild amusement.

The non-believers say, in essence, that the time of installing a computer system may be the worst possible time to introduce strange peripheral devices to the computer site.

They argue that the situation will be confusing enough just *(Continued on Page S/26)*

Interface Standards Needed Immediately

(Continued from Page S/24)

ment manufactured by independent companies. Many observers say that all of the manufacturers choose different ways to interface their peripherals with their mainframes.

If a standard does exist, they add, it is the IBM interface, because most of the independent manufacturers are developing equipment that is plug-to-plug compatible with the IBM mainframes. This is a natural development since 70% of the market for independent equipment, and independent software is composed of IBM users.

Present Efforts Discussed

At present there is a three way effort to develop standards for peripheral interfaces outside of Ansi: one at the National Bureau of Standards, one by the Association of Independent Peripheral Manufacturers, and one by government procurement experts within GSA.

A group at NBS is working on a standard for a peripheral interface and Grosch has promised that this effort will be accelerated if organizations like Ansi do not develop a voluntary standard in the near future. If the bureau develops and approves a standard for the federal government, no equipment could be sold to the government that did not meet the standard specifications.

Other officers in the government, however, note that NBS is often slow in its standard work and say that it is a difficult process to have standards adopted for government use. Without a voluntary industry standard, they indicate, it will be hard for the government to adopt a standard on its own.

The Association of Independent Peripheral Manufacturers, formed at the Fall Joint Computer Conference last year under the direction of Richard Caveney of Bryant Computer Products, hopes to influence government officials to develop or accept a standard for a common interface.

Everyone Looks to Independents

Some government procurement officials are active in the effort to develop a standard peripheral interface. They are trying to persuade the computer manufacturers to voluntarily adopt a standard, which they feel will allow the government a wider choice in its computer purchases.

While most of the officials cannot take an active part in standards development, they support the idea and hope that the industry will develop one voluntarily without the necessity of government pressure.

If the industry cannot get together and decide on standardization efforts, it appears that the government is standing in the corner and would not be adverse to stepping in and forcing standards on the computer community.

Independent Peripherals—Install on New Systems

(Continued from Page S/25)

trying to install the computer. Also, they ask, how can the hardware and software problems normally associated with "new-ness" be effectively isolated and identified when there are two or more involved manufacturers uniformly pleading total innocence? Besides, they conclude, it's just too dangerous to build a new computer system and computerized applications around a basically experimental concept.

The period surrounding installation of a computer system need not be one of confusion and upheaval. In fact, with intelligent planning and careful management, the conversion to a new computer system can be a salutary event for the entire company. It can be a time of long-overdue housecleaning.

Files, programs, and systems can be revamped, and supporting areas, such as training, documentation, and standards, can be similarly overhauled. Introduction of I/P devices at this time can be neatly accomplished, since they represent just another class of system components for which all things are being made ready.

System Testing a Smokescreen

Arguing that it is difficult to pinpoint sources of system malfunction at computer installation time because of independent devices is a smokescreen tactic devised by the mainframe suppliers. It is meant to instill fear in the heart of the computer user and so prevent him from assembling his computer configuration with the products of

more than one supplier.

If the hardware suppliers have difficulty in testing their equipment, this is their concern, not the user's. For purposes of better price and performance, the user has brought together the products of various suppliers. He has received commitments of intra-system compatibility and installation support. He can now expect and reasonably demand a satisfactory level of performance.

Each supplier in this environment must carefully test his own products. But he should also assist in testing the integration of his products with those of another supplier.

Users Set the Ground Rules

The user sets up new ground rules when he designs and assembles his multi-supplier system.

Those suppliers who have elected to install equipment under these ground rules must be prepared to assist the user in achieving his primary goal: making the entire computer system operational as soon as possible. Suppliers guilty of only token assistance during this shakedown period should be replaced as soon as practicable.

In these circumstances everyone can benefit, since each supplier will tend to test his equipment thoroughly and exhaustively before risking the embarrassment of a malfunction detected by another supplier as devices are integrated. Because of such thorough testing, the entire system is likely to become operational in a minimum of time.

The manufacturer of the I/P device is given a fair and just

opportunity of succeeding in these circumstances, since *all* equipment must be considered suspect until proven operational. If these devices were to be installed in an existing computer installation, the supplier could be expected to be continually on the defensive.

Any and all problems encountered by the installation during a period of roughly three months before and three months after the advent of the foreign equipment would be attributed to the "foreigners."

Don't Experiment

And finally, it is a questionable tactic to consider installing I/P devices just for experimentation. In other words, they must be employed in a production environment, for that is probably why they were originally selected: to reduce costs and improve performance in the company's "bread and butter" applications.

Of course, when installing these devices, effective fallback and bypass procedures must be prepared to permit the company and its data processing operation to continue functioning in case the devices should malfunction. Such procedures are necessary to back up all systems in a computer installation. Only the unwary user will allow himself to be lulled into careless complacency by the thought that all his equipment is supplied by some dominant mainframe manufacturer and that, therefore, fallback and bypass procedures are an unnecessary luxury.

There are still other arguments supporting this thesis.

• Economic justification — as an aid to justifying the cost of a new computer system to top management, considerable cost savings can be demonstrated through this enlightened approach to selecting peripheral devices.

• Enthusiastic support — the supplier of the foreign peripheral devices will tend to give his very best in the situation in which his devices have been selected to form an integral part of a new computer system. Deliveries will be on time, since an entire computer system hangs in the balance. Installation support will be impressive; as he tries to out-support and out-perform the "big boy" — the supplier of the mainframe.

He will welcome the opportunity to justify the confidence placed in him and his product. (In other circumstances he too often finds his product in the rear of the computer room, hidden behind a wall of core memory, vainly participating in someone's "crackpot experiment.")

• Psychological acceptance — if the independent devices are installed together with the rest of the computer system, operational personnel will tend to accept them more easily as good and reliable devices. If such devices are added to existing computer systems, they are often regarded with considerable suspicion and distrust, especially since the addition of the equipment probably entails some retraining and revamping of existing operating procedures. Thus,

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CW Interviews Users

Independent Peripheral Users Discuss Savings, Support

By Christine Magnuson
CW Staff Writer

What do suppliers of independent peripheral equipment offer?

"Better equipment" — "variety" — "trial contracts so that users aren't committed."

These were the reactions of DP executives of five major users of independent peripherals: one software house, two large industrial companies, a major airline, and a large mainframe manufacturer.

Money Savings

Four of the five companies reported savings from using independent peripherals (I/P) while one firm listed cost as a factor in selecting I/P, but would not comment on whether it is saving money.

The computer manufacturer said it was saving money by using I/P, but that it uses them only when it cannot use its own equipment.

Equipment reliability, compatibility, performance, and cost were the principal reasons for selecting I/P equipment, the firm said.

Although cost predominated as a factor, one DP manager selected I/P only with recommendations of other users. The service company spokesman considers "heresay dependability" an important factor.

A large airline is acquiring 100 line printers from an I/P supplier because the equipment is noise-free. Offers of on-site service influenced another user.

Delivery schedules led a third company to turn to I/P because time was an essential element of its operations.

A large chemical company expects I/P "to perform as well and to cost less."

Problems with I/P included initial mechanical and maintenance problems. One organization reported "inconsistent performance" with tape drives.

A large chemical company told CW that its problems were more "with the people working with the hardware than with the hardware itself."

While the only I/P the five companies are using now are line printers, disk drives, and tape drives, they plan to expand the list to include plotters, optical character recognition equipment, terminal interfaces, and bulk core, as well as more printers and drives.

Two companies have computer output-to-microfilm equipment and two more are considering obtaining COM units by the end of 1972. One company already has audio response equipment and three others intend to by 1972.

Drive Decrease

The spokesman for the computer manufacturer expects a decreases in I/P disk drives, magnetic tape drives, and line printers in his facilities by 1972.

None of the companies uses key-to-disk equipment. Three have a total of 13 key-to-tape devices, and these three expect to double this number by 1972.

The service company reported that it has "no projections at present" for peripherals to be installed by 1972; except for key-to-tape equipment.

CPU Association

Three companies associate their I/P with IBM CPUs, one with IBM and RCA, while the computer maker would not comment.

These organizations told CW that future I/P would probably be associated with CPUs such as the GE 635, IBM 360s, RCA Spectra 70s, and the Honeywell 16 series.

Users Told To Install I/P at Start

the devices are installed with two strikes against them.

● Ease of installation — if the devices are installed in conjunction with the rest of the computer system, the act of physical installation should be fairly routine, since all power, space, and cabling requirements will have been provided for well in advance of equipment delivery, and all system components will be installed at the same time.

● A dvantageous discomfort — using computer-related hardware from more than one manufacturer will tend to keep "honest" the largest of the suppliers (generally the supplier of the central processor). This supplier will clearly recognize that the company's data processing management is not adverse to "shopping around."

For these reasons a clear recommendation can be made: companies currently considering installing a new computer system should also consider installing less expensive and better performing I/P devices at the same time.

It can be an ideal opportunity to experience the many benefits that these devices can bring to a data processing installation.

J. Burt Totaro is vice-president and technical director of Computer Conversions, Inc., a firm that specializes in providing assistance to companies installing computer systems. He is also associate publisher of Datapro 70, a new hardware/software reference service for EDP management.

The Computer Output Microfilmer

If your job involves specifying an under-$50,000 COM unit to replace an anachronistic impact printer, we offer you several key points of comparison, all of which favor the PTI 1300.

Consider print quality

Important people have to read what your Computer Output Microfilmer prints. You must rank legibility high among the human use factors you weigh. We urge you to compare the print quality of film produced on the PTI 1300 with any you have examined.

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We did not retouch this picture. It is a sample of data printed from film made on the PTI 1300 Computer Output Microfilmer. (It looked even better, of course, before press reproduction.)

Will it work with your software?

Any COM that can accept your computer's output without flinching has some decided advantages over one that doesn't. The PTI 1300 does.

It accepts any standard print tape format.

Ease of operation

Our design intent was to create a COM that most computer users could afford. We also wanted to make it unnecessary for you to hire sophisticated computer or film people to operate it. If you have girls who can load and unload computer tape transports, they can operate the PTI 1300 for you.

Is it compatible with existing microfilm equipment and supplies?

Standards are hard to establish in the exploding microfilm business. But your new COM ought to use film processing materials that are universally available.

The PTI 1300 does.

Flexibility?

Look for these features that give your COM versatility:

- cine or comic mode printing
- x24 or x42 reductions
- variable film pull-down
- bold and normal printing
- upper and lower case characters

They're all available with the PTI 1300.

Reliability!

Not a word that has always been attached to COMs, reliability has been designed into the PTI 1300 through the use of solid-state electronics and high MTBF components.

Off-line vs on-line

You may have considered the potential of an on-line COM; but we're suggesting that you explore the art with an off-line unit first. Assign it sample tasks without tying up your entire computer operation. Use it to print out certain kinds of information best suited to microfilm. Put it alongside your impact printer for cost analysis.
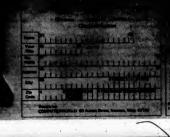
Conversation encouraged

An investment in COM, even in the under-$50,000 range, is a major capital expenditure. Be certain that the price includes a tape deck and interface. The PTI 1300 does. There are a great many other details to explore before you finally select the PTI 1300. Please write, wire, or phone us for any answers you may need. Peripheral Technology, Incorporated, 757 N. Pastoria Avenue, Sunnyvale, California 94086. (408) 732-4940.

PERIPHERAL TECHNOLOGY INCORPORATED

All IBM Tapes, Disks Have Plug-to-Plug Counterparts

By Frank Plasta
CW Staff Writer

Tape and disk drives and disk systems dominate the list of devices that the buyer of plug-to-plug peripherals has to choose from.

The user of an IBM computer system can replace his second generation 729 tape drives, his third generation 2400 series tape drives, and his 2311 and 2314 disk devices with independently manufactured peripherals.

The choice of makers is wide. The user can get at least equal, if not better, performance, and at a lower cost than he did with his original equipment.

The most widely used of the independent peripherals are tape drives. It is estimated that one maker alone has between 2,000 and 3,000 units installed and running on IBM systems.

Four companies supply most of the plug-to-plug tape drives. In alphabetical order, these are: Ampex, Management Assistance Inc. (MAI), Potter, and Telex.

Ampex has been building tape drives for years, but until recently sold them on an OEM basis only. In December, 1968, however, it started delivering plug-to-plug compatible tape units with the Ampex name on them to end users. The TM-16 line of tape drives has a counterpart for every one of IBM's 729 series models and for Models 2, 3, 5, and 6 of the 2400 series of tape drives, both 7- and 9-track models. No 1,600 bit/in. drives are available, however.

Ampex claims that the replacement units will have equal or better performance, reliability, and maintainability compared to the devices they were designed to replace. The drives all have a single capstan transport which, Ampex says, provides high reliability, excellent maintainability, and gentle tape handling.

MAI does not manufacture drives; it buys them from the manufacturer as OEM equipment and then sells, or leases them to the end-user. MAI also provides the maintenance on the drives it markets. The pattern seems to work; MAI accounts for the largest share of the replacement tape drive market.

The MAI tape handlers are manufactured by Potter Instruments Co. to MAI's specifications. They are exact replacement devices for the IBM units.

Do you make minicomputers?

Send us company and product information for an upcoming survey. Send to:
CW Supplement Editor
797 Washington St.
Newton, Mass. 02160

The MAI 7200 series replaces the IBM 729 Models IV, V, and VI, while the MAI 2400 is the replacement series for the IBM 2401 and 2402, Models 2, 3, 5, and 6.

Potter Instruments Co. has been manufacturing tape drives for the OEM market since 1952. At first, the market consisted of only manufacturers, including MAI. More recently, Potter has begun marketing and servicing its own devices.

Among these are a selection of IBM-compatible tape drives. Since Potter made the MAI drives, it should come as no surprise that the models correspond to the MAI models. The Potter design has some features that are said to make it superior to the IBM units. Among them are a retractable read-write head, said to reduce tape wear, and a single capstan drive that reduces tape stretching and breakage. It also features straight-line loading.

Telex, the second largest supplier of independent peripherals, is not a veteran manufacturer in the area of computer drives, but has a great deal of experience in magnetic recording, through its subsidiary, Magnacord, a name well known in audio recording.

Telex also manufactures drives to replace the IBM units. The Telex 4700 series replaces the IBM 729s and the Telex 4800 series, and the IBM 2401 drives. Very recently announced were the 4852 and 4862 models to replace the IBM 2402, offering 800 and 1,600 bit/in. phase encoding. Telex drives feature that company's patented positive pressure pneumatic drive.

There is much more competition for the plug-to-plug compatible disk drive market — IBM 2311s and 2314s, mostly.

As with tape drives, the supplier arranges for service, but unlike the tape makers, some third party maintenance is used.

The companies in the disk drive business include: Bryant Computer Products, California Computer Products, Information Storage Systems, Inc, MAI, Memorex, Potter Instrument, Talcott Computer Leasing, and Telex.

Bryant

The Bryant 1100 is a replacement unit for the IBM 2311. The performance given for the Bryant unit, made by Linnell, matches exactly that of the IBM 2311. Bryant states, however, that the reliability of its unit is superior to that of IBM's due to superior production control systems.

CalComp

California Computing Products, better known as CalComp, entered the disk field recently by financing Centry Data Systems. CalComp will sell or lease the Century drives to end-users, while Century will build and sell them on the OEM market.

The CD1 from CalComp is compatible with the IBM 2311, while the CD12 drive with CD14 controller is the counterpart of the 2314 system. Performance claimed for the CD1 is considerably faster than for the IBM unit with an average access time of 30 msec, compared to 75 for the IBM unit. The CD12 is some-

what slower than the CD1, 45 msec, but still ahead of the 2314 at 60 msec.

ISS

Information Storage Systems (ISS) is another newcomer to the disk area. The product they offer is compatible with the IBM 2314, but said to be twice as fast. ISS has claimed that the average access time of the ISS 714 is 32 msec, as opposed to 60 msec for the IBM 2314A1 and 75 msec for the IBM 2314. The company's 2311-compatible ISS 711 was announced earlier. It too has a considerable speed advantage over the IBM unit. The ISS average access time is given as 30 msec against 75 msec for the 2311.

MAI

MAI sells the Memorex drive and services it. Performance figures for the Memorex unit can be applied to the MAI device.

Memorex

Memorex has recently introduced the 3660 system, consisting of a 661 controller, and 660 disk drives. This system is compatible with, and competitive to the IBM 2314 system. The performance of the 3660 is better than that of the IBM 2314. The average access time of the 660 drive is 50 msec. Memorex also offers a 2311-compatible drive, also featuring superior performance.

Potter

Potter Instrument also makes disk drives and disk systems. It had earlier produced the 2311-compatible unit, with, and with performance levels similar to, the IBM 2311 except for shorter start-up and stop times. Recently, Potter has introduced the system concept to their plug-to-plug products by making available the DD4314 disk drive with the DC5314 controller, creating a system compatible with the IBM 2314 system, but 13% faster.

Talcott

Talcott Computer Leasing came into the plug-to-plug disk field by entering into an agreement with Singer-Friden. The agreement involved the 9311 disk drive, developed by Friden. According to the agreement, Friden will manufacture, market, and service the drive, while Talcott will handle the leasing. The drive features an electronic servomechanism that has fewer parts, with resulting greater reliability. The 9311 is 2311-compatible.

Telex

Telex sells fast disk drives, at least judging by the published access times. An average access time of 30 msec for the 2311-compatible Telex 5311 is given, compared to 75 msec. The company also claims that the drive has a start-up time that is only 25% of that for the IBM unit.

In addition to the 5311, Telex also markets the 5314 disk storage system. The average access time of 32 msec and start-up times also are considerably better than those of the IBM system with which the Telex is compatible.

Potter SC2400 tape drive is compatible with IBM 2400 series

MAI 2301 disk drive is compatible with IBM 2311s

CalComp CD1 disk drive is compatible with IBM 2311s

The Ampex tape drive is compatible with IBM 729 drives

Independent Market Viewpoint

Independent Peripherals Are a $150 Million Business

By Eugene E. Prince
Special to Computerworld

Less than five years ago, there was no such thing as an independent peripheral industry servicing the end-user. By the end of 1969 the industry had risen to an estimated $100-$150 million annual volume, and the market is just beginning to grow.

Quite an adolescent. But in the 1970s the young industry must prove its manhood in a community of computer manufacturers that historically have considered the end-user their exclusive territory.

In this environment, many I/P suppliers will lose their share of the market and many new companies will have a hard time functioning after introducing their first products. Other firms, however, will increase their market share beyond the present most liberal estimates.

Which way a company goes will depend not merely upon how much lower its prices are than those of IBM, but more upon how it responds to some dramatic developments now taking place on the customer side of the industry.

These are three of them:

● End-users of peripheral equipment are no longer just EDP managers and programming supervisors. Through time-sharing and the proliferation of terminals and minicomputers, they are spreading out in every direction.

● The traditional end-user, EDP management, has been experiencing an emancipation of the mind, due to the emergence of more plug-to-plug compatible peripherals. But as his sophistication increases, so will his demands.

● The European market is opening up. Large computer installations are beginning to emulate their U.S. counterparts and shop around for additional peripherals, and the total computer market is growing rapidly.

Such developments as these make the 70s the decade of truth for the independent peripheral suppliers. On one hand they provide the industry with unprecedented opportunity. On the other, they represent its severest challenges.

The New Users

Supplying peripherals for such systems as desk-top computers and data-entry terminals confronts manufacturers with equipment design challenges such as they have never faced before.

Peripheral firms must human-engineer their tape drives, key-boards, printers, and other devices with the layman in mind.

Simplicity of operation isn't all it takes to make a profit in this huge but low-cost market. The peripheral supplier must combine high reliability and ease of maintenance in the product and must produce and deliver large quantities efficiently. These are the stringent requirements that lie behind the glitter of the terminal and minicomputer markets. They will filter out many companies not sufficiently deep in technical and operational resources.

The Plug-Compatible Market

The late 1960s saw independent peripheral companies for the first time offer tape drives, core memories, and disk drives that are plug-to-plug compatible with various models of the IBM 360.

Selling directly to the user was a new experience for these firms, but designing equipment for the user was not. The companies already had been doing it for years, as suppliers to original equipment manufacturers.

While the test for peripheral firms in the terminal and mini-computer market will come in hardware design, the most vital requirement in the computer-user area will be service. The peripheral company that sells a bank of tape drives to a large computer installation knows that it must service those drives competitively with the firm that supplied the original computer equipment.

Service to the user will not end with maintenance of the plug-to-plug compatible peripherals. One example of further services this industry can offer to users is counseling.

Mr. Prince is the vice-president and general manager of Ampex Corp., Computer Products Division.

Savings and Support Are User Topics

The I/P manufacturers supply service and maintenance for products to all organizations surveyed. For four organizations, the servicing operation is local to the site.
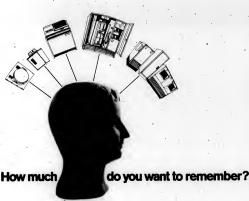
Cost of I/P Equipment

One organization expects the percentage of total monthly expenditures for I/P equipment to, be under 10% both in 1971 and 1972.

A second company estimates the cost of all peripheral hardware to be around 25% of the total monthly data processing hardware costs, and expects I/P hardware to be at least 50% of total monthly expenditures in 1971 and above 50% in 1972, if the company enters the communications field.

The airline interviewed expects its total monthly expenditures for I/P hardware to be 33% in 1971, and over 33% in 1972.

The companies chosen for the survey were selected from a report issued to Congress by the Government Accounting Organization (GAO) last June titled "Study of the Acquisition of Peripheral Equipment for use with Automatic Data Processing Systems."

Independents Create Brand-New Types of Peripherals

By Peter L. Briggs
CW Supplement Editor

Peripherals from independents can be pretty far from the kind of equipment available from mainframe manufacturers.

A peripheral for sorting and a peripheral that behaves like a 1401 but runs directly from an IBM 360 were highlights of last year's introductions of new types of equipment.

The sorter, produced by Astrodata, is a hardware version of the sorting algorithm used by the IBM Sort. It is connected to I/O channels directly, and reads data into its own memory for high-speed sorting.

The principle has one limitation — the amount of data that can be sorted at one time is limited by the size of the sorter's internal memory.

The biggest advantages to this device are the elimination of the tremendous workload for sorts on peripheral devices like disks and tapes and the lightening of the volume of data that must be transferred in the I/O channels.

In the Astrodata 1651, there is a memory drum that can store 2.5 million bytes. The device is accessed through the B-15 exit from the OS Sort. For files larger than the drum capacity, the unit sorts them in segments, and the OS Sort/Merge must merge the sorted file segments.

The company's figures show that the device should pay its own way (it rents for $6,500/mo) when an installation spends 20% to 25% of its time sorting data.

The independent peripheral companies have the opportunity to develop this kind of equipment easily and cheaply, where the major manufacturers cannot afford to develop products that replace equipment they have out on rental.

There are rumors of forthcoming peripheral devices that act as data base storage systems with all the logic for data searching built into the device. This would really place the user in a position to compare hardware costs with software costs.

A system running on hardware offers higher speeds and is generally simpler to use.

Software-based systems are more flexible, subject to limitations in design, and cost less for the initial investment.

Eventually companies could apply the same logical approach Standard Computing Corp. has used in the IC-7000 computer. The microprogramming is altered to fit the customer's needs when the machine is built. It is easily alterable.

A New Kind of I/P

The combination of the variable-logic microprogramming and a minicomputer could be built together and produce any type of peripheral desired.

The price of such equipment would be cheaper than most peripherals available today.

No controllers would be needed, since the built-in minicomputer could handle all the control and interfacing requirements.

Using minicomputers within peripherals would also solve the standardization problem.

The standardized interface would actually be a software interface, or a microprogramming implementation of a software interface.

A Technology Race

There will be a race between two different kinds of technology, and the outcome of this race will determine the kind of equipment that will be used to store data 10 years from now.

There has been a tremendous growth in the technology of optical storing of data, particularly with the IBM holographic storage system already working in the laboratory.

The technology of minicomputers and the mechanics of handling tapes and disk packs is also breaking new ground, as shown by the use of single-capstan tape drives, and electronic — as opposed to hydraulic — arm positioning for disk drives.

The winner of this race will, in the long run, be the optical or mass memory. However, if sufficient cost reductions can be made in mechanical peripherals, they can be expected to be around for at least another 10 years as a major data storage medium.

New Applications Needs

Some of the larger users are currently developing applications that have never been tried before. These applications will require new kinds of equipment for input, processing, and output.

New techniques for direct input from the source location, for example a warehouse or a department store, will require the ability to get data into a system cheaply and with no delays.

The processing requirements, though great for each transaction, will be enormous for the high volume of transactions anticipated — well into the hundreds of thousands per hour. No existing computers can process such volumes of data economically.

The entire idea of output will be altered. No longer will the principal output be in the form of reports. Output must be dynamic — it must respond to the needs of a sales clerk, a production foreman, or a warehouse shipper.

The Cummins Scanak 216...
A Scanner that works!

A recent independent survey of actual installations showed that Scanak, when compared to Scanners costing far more*, provided greater through-put with only a fraction of the rejects. Because of its greater flexibility, the average Scanak was used on a greater number of applications than the more expensive machines.

The study also revealed that Scanak was operational in a fraction of the time it took other installations — because there are no programs to write. It works off-line and users just patched their existing programs. Scanak had less down time. Look what *Auerbach* says: "This system utilizes recognition circuitry that is less intricate and more reliable than that of OCR scanners."

*Scanak rentals start at less than $1000 per month, including maintenance.

Who uses Scanak and for what?

Scanak is now in use or on order by such different institutions as municipal governments, textile and apparel manufacturers, dairies, publications, associations, hospitals, banks, manufacturers, department stores, insurance companies, distributors, utilities, and of course, independent data centers. Some of their applications are: revolving credit billing and payment processing, labor reporting, route accounting, instalment payment processing, subscription fulfillment, inventory withdrawals, payroll, goods-in-process reporting, and savings account transactions.

If you have a computer, and more than two keypunch or key tape operators, you probably need a Scanak.

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IBM Adds Channel, Storage Unit to 360/85, 195

WHITE PLAINS, N.Y. — IBM has added high-speed data multiplexing and a disk storage unit to its two most powerful systems.

The new devices, designed for the 360/85 and 195 models, are the IBM 2880 block multiplexer channel and the IBM 2305 fixed storage facility.

The block multiplexer, with a data rate of three million byte/sec, is said by IBM to offer twice the capability previously available with other IBM channels. With the 2880, up to 12 high-speed data channels can be attached to the 85 and up to 13 to the 195. Previously, a maximum of six channels could be used with these models.

Data blocks from direct access storage devices can be multiplexed along the 2880 channel's single data path.

The 2305 is a fixed head disk storage device with a capacity of 22.4 million bytes. It comes with one or two drives. Each drive houses six 14-inch oxide-coated disks providing 12 recording surfaces. The one-head-per-track design is said by IBM to minimize the time needed to find a record.

One version of the disk system offers capacities of 5.4 million or 10.8 million bytes. Average access time is 2.5 msec and the transfer rate is three million byte/sec. Another model has capacities of 11.2 million or 22.4 million bytes, with average access time of five msec and transfer rate of 1.5 million byte/sec.

Rotational position sensing, a design feature built into the 2305, allows the unit to signal the I/O channel when information is to be sent, keeping the

channel's data path free to handle other requests during the various stages of execution. Logic within the 2305 permits it to search for up to 16 requests simultaneously, increasing the effective data rate.

Monthly rental prices for the 2880 channel range from $3,000 to $4,950; purchase prices from $141,800 to $232,650. Customer shipments are scheduled to begin in the first quarter of 1971.

Monthly rental prices range from $6,400 to $12,800 for the 2305 storage facility. Purchase prices are from $300,800 to $601,600. Deliveries are scheduled to begin in the second quarter of 1971.

Burroughs Largest 'E' Accounting System
Uses Cobol Programs Compiled on B3500

DETROIT, Mich. — The new Burroughs E8000, the largest and most powerful system in the company's Series E electronic accounting system line, can use programs written in a subset of Cobol and compiled on a B3500.

"The E8000 approaches full-scale computer systems in size, power, and performance, and

functions either under operator control in the manner of an electronic accounting machine, or under internal program control, like a computer system," said Ray W. Macdonald, Burroughs president.

The E8000 is a modular system, using a variety of plug-in peripherals. This allows customers to expand the system as business grows, according to Burroughs.

The E8000 has 400 words of high-speed memory. Information can be read into the system by dual punched card readers, each of which can read 300 card/min in flow mode and 200 card/min in demand mode by the magnetic striped ledger reader or by an electronic keyboard.

Output can be obtained on a 164 line/min printer in the form of punched cards or perforated tape, and as data encoded and printed on ledger cards. Another feature of the system is a spherical console printer which prints at up to 19 char/sec.

The control console features

alphanumeric input, random access to 400 words (12-digit words plus sign) of core memory, automatic forms handling, reverse entry control and operator/system communications.

Burroughs magnetic striped ledger cards provide hard copy records with electronic storage of data in the magnetic stripe. The magnetic striped ledgers extend the memory of the E8000. Statistical coding stored in the stripes on ledger cards can trigger the E8000 to automatically distribute information into and retrieve information from system memory.

Programs written for the E8000 in Cobol will be compiled on any Burroughs B3500 EDP system to generate machine language directly. The E8000 can only assemble programs written for the system in a symbolic assembler language.

The E8000 will sell in the $35,000 to $60,000 range. Monthly lease rates run from $875 to $1,500. Initial deliveries of the system are scheduled for the second quarter of 1970.

E8000 Accounting System

'Draft Aid' Turns Sketch Into Drawing

S. WINDSOR, Conn. — A turnkey drafting system said to permit draftsmen untrained in computer technology to produce quality drawings is available from The Gerber Scientific Instrument Co.

Designated Draft Aid, the self-contained system built for real-time operation directly translates rough sketches into camera-ready, ink-on-vellum drawings, the company stated.

With an overall accuracy of ±.004 inch at speeds to 600 in./min, Draft Aid can draw an average "C" size schematic in six to eight minutes after completion of data input with far greater precision than can be obtained manually, the company stated.

Draft Aid utilizes standard Gerber computer-controlled automatic drafting equipment supplemented with a magnetic tape storage unit and software developed to produce finished drawings ready for reproduction by photographic or diazo processes.

The Draft Aid system includes a versatile Gerber Series 1200 stored program control featuring a Hewlett-Packard computer with 8K of core memory, teletypewriter, and 400 char/sec photo-electric tape reader and spooler which processes the in-

Draft Aid Turnkey System

put data and outputs commands directly to the drafting table.

The compact cartridge magnetic tape storage unit interfaced with the control reportedly facilitates Draft Aid operation by providing storage for an unlimited number of drafting symbols and commands.

Three tables available for use with the system include the Model 23, the standard table with a 34 x 44 inch drawing area, and two optional larger electrically tiltable tables — the Model 22 (48 x 58 inch drawing area) and the Model 75 with a drawing surface up to 5 x 24 feet.

The equipment, with Draft Aid core resident software, eliminates remote or separate pre- or post-processing of data, according to the company. The software provides for linear and quadrant circular interpolation, with circular interpolation possible in drawing, symbol and alphanumeric modes.

The company states that the moderate cost for the standard system is $89,900 in the U.S. Leasing arrangements are available. Delivery is approximately 120 days.

The company is located at 83 Gerber Road.

Multiplexers Transmit Multiple Message Data Stream

SILVER SPRING, Md. — Tel-Tech Corp. has available two time division multiplexers. These data communications

concentrators have been designed to provide an economical means to transmit multiple independent low-speed data streams over a single voice-grade telephone circuit, according to the manufacturer.

The Model TTC-2000 concentrator is intended for point-to-point communication links. The Model TTC-3000, designed for multipoint networks, will permit full contention for channels from remote stations.

Both models will transmit up to 38 full duplex channels of data over a single 3K Hz Type 3002 voice grade circuit. The channels may operate at speeds

of 110, 135, 150, or 300 bit/sec. The multiplexer can use as few as two channels. Increased channel capacity can be added by plugging in additional channel cards.

The multiplexers are available on a 30- to 60-day delivery schedule. A company spokesman stated that prices vary with the number of channels the user desires to implement. As an example, a 10-channel TTC-2000 system costs $8,200, he added.

Tel-Tech Corp. is located at 9170 Brookville Road.

The TTC-3000, although simple in design, reportedly provides for system expansion. At

the remote end, the multiplexer can be interfaced with a dial, dedicated or polled communications system. Individual channel indicators show system traffic and verify the availability of channels.

TTC-3000 Concentrator

'Expedata' Joins Reader, Modem

KEENE, N.H. — A device available from Bonnar-Vawter Inc. combines a paper tape reader and a 400 series modem.

Designated the Expedata 600, the device reportedly transmits data recorded on paper tape over voice-grade telephone lines inexpensively. The Expedata is used with an AT&T data access arrangement (DAA) terminal con-

nection during operation. The 600 reads and transmits data in parallel mode, five or eight-level code format at 60 char/sec, the company says.

The Expedata 600 unit costs $900, and delivery is three months, according to a company spokesman.

Bonnar-Vawter Inc. is located at 96 Dunbar Street.

Plug-to-Plug Disks Available for H-P, Varian Minis

Special to Computerworld

PALO ALTO, Calif. — Inexpensive plug-to-plug compatible disk memories for four models of Hewlett-Packard and Varian minicomputers are now available from Data Disc Inc.

Claiming to establish a new trend in independent peripherals, Data Disc is offering the new systems at prices that are said to be below those of the minicomputers with which they interface.

Included in the price are installation costs, "mini-disk" software, familiarization training, and maintenance for one year.

Data Disc says that the plug-in memories are so reliable and easy to operate that they can be used instead of additional core-memory banks. They are described as fast-access files for frequently used programs as well as for data collection and storage.

The basic Data Disc plug-in memory has

systems/peripherals

word capacities of 46K for the Model 1757 and 32K for the Model 1703. Both models are expandable by unit substitution. Additional memory sizes of 92K, 184K, and 368K are available for the 1757. The 1703 is available in additional capacities of 64K, 128K, and 256K. The storage medium is a 12-inch disk with one head per track. One recording

surface is used on the smaller memories, with two surfaces on the larger sizes. Average access time is 16.7 msec, according to the company.

The Model 1757, designed for use with Hewlett-Packard 2114B, 2115A, and 2116ARB computers, is block-addressable. Two mainframe I/O slots are required for the 1757 interface. Existing Hewlett-Packard disk software can be used, together with additional software from Data Disc.

The Model 1703 is built for Varian 620/i computers and is word-addressable. One circuit card must be installed in the

Varian 620/i memory expansion/peripheral controller chassis to provide an interface. As with the 1757, existing Varian disk software, combined with software from Data Disc, is used.

The memory system is made up of a disk memory, a power supply and a computer interface. The basic models of both systems are priced at $7,500. Maintenance, after the first year, can be contracted at $60/mo and up. Both systems are available on a 30-day delivery schedule.

Data Disc Inc. is located at 1275 California Ave.

Lower-Priced Processor Added to GE-PAC Series

PHOENIX, Ariz. — GE has developed a new modular process computer. Designated the GE-PAC 4010, the medium-priced system complements the larger GE-PAC 4020. On-line dependability and

flexibility are said by GE to be offered through modular packaging, use of integrated circuits, and the application of GE-PAC 4020 software. GE aims the GE-PAC 4010 at applications smaller

than those economically served by the GE-PAC 4020.

The GE-PAC 4010 includes two new subsystems: a fast analog input scanner and a versatile dual bulk memory subsystem.

The scanner can view up to 600 point/sec in multichannel mode, and can be reconfigured and expanded in the field by plug-in connections. Signal conditioning modules are also plug-in, allowing fast and easy modification, GE stated.

Up to four disk or drum storage devices, in any combination, are accommodated by a dual-bulk memory controller. These

A dirty tape can drive a computer crazy.

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Our special formulation starts cleaner. Every inch of every reel is

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The first step is clean tape. Ours.

RCA Computer Tape

GE-PAC 4010

storage units can be added on a plug-in basis, without any cabinet rewiring. Each drum storage device has a maximum capacity of 524K words; a disk unit can accommodate up to two million words.

The GE-PAC 4010 computer employs a 24-bit word at a price said to be competitive with many 16-bit machines. This word length simplifies programming and allows more throughput for a given size core, according to GE.

The instruction set, identical to that of the GE-PAC 4020, can handle the wide variety of complex operations required in process control, GE says.

Additional features include a 1.6 μsec memory cycle time, up to 64 interrupt levels, memory protection, relative addressing for full use of core memory, and block data transfer independent of a running program.

Several plug-in data peripherals are available. These include teletypewriters, line printer, card and paper tape punches and readers, Datanet CRT display terminal, and a data link for local or remote communication with another GE-PAC process computer.

Integrated circuits are utilized throughout the GE-PAC 4010 process computer. GE claims the use of these devices improves reliability and yields compactness in packaging, simplifying maintenance.

The Omnibus family of standard software packages, developed earlier for the GE-PAC 4020, is also available for the 4010. The packages use fill-in-the-blanks and conversational programming, and allow control engineers with a minimum of programming experience to tailor a system to individual user needs, according to GE.

Fortran, Cobol Guides Helpful for Trainees

ALBUQUERQUE, N.M. — Language reference guides for IBM 360 Fortran IV and Cobol (OS and DOS) are available from Compusys, Inc.

The guides are designed for training programmers, but their long-term usefulness is limited because the company has no plans for updating, a spokesman reported.

The Cobol guide consists of a set of three sheets and sells for $5.00. The Fortran IV guide is available on one sheet which sells for $2.50.

Compusys compiled the guides as a method of providing concise information, easily understood explanations, and illustrative examples.

Educational institutions receive a 25% discount. Discounts of 10% on orders of 100 or more of each type and of 20% for orders of 1,000 or more are offered to volume purchasers.

The address of Compusys Inc. is P.O. Box 11104.

Interface Provides Input to Computer

CLIFTON, N.J. — A digital data interface is available that provides direct data inputs to printer, to computer, or to both simultaneously for the purpose of recording or processing weighings made by electronic balances.

The device, called the Torbal Data Interface System, is offered in two models

dp accessories

from The Torsion Balance Co. The systems give a printed record of weighings and provide a simultaneous input signal for subsequent data analysis by computer or processor.

The Torbal systems will telescope operations by replacing three steps (hand-written records, transcription of records into manually punched cards, and feeding of cards into a card reader) with a single step

(pressing a button), according to the company.

The systems operate as a sample or unknown is rapidly weighed on the torsion-principle balance. When the operator chooses to enter the weight data displayed visually on the balance readout, he depresses a data-entry pushbutton which enters a printed record of the weight reading and/or a direct input signal to a computer or data processor.

The Torbal Data Interface Systems provide a binary coded decimal (BCD) output for six complete 0-through-9 decimal line data outputs, plus one line for a one digit override.

Model EA-1 C/P system (balance with interface and Victor Imperial printer) costs $3,100. The Model ET-1 C/P system

Model EA-1 C/P Data Interface System

costs $3,000. The company states that other printers for either system are available on special order. Delivery is 60 days for the systems.

The Torsion Balance Co. is located at 35 Monhegan St.

$260/Month System Converts MT/ST Tape

BLADENSBURG, Md. — A system available from Digi-Data Corp. converts IBM Magnetic Tape Selectric Typewriter (MT/ST) tape to computer-compatible tape.

Called the Digi-Data System 30, the stand-alone converter is available for either seven- or nine-track magnetic tape. The information on the MT/ST tape is transferred, and the cartridge is rewound.

The converter leases at $260/mo. Digi-Data Corp. is located at 4315 Baltimore Ave.

Low-Cost COM Retriever Features Large, Nonglare Viewing Screen

NEW YORK — A low-cost computer output microfilm (COM) retriever features the largest viewing screen in the industry, according to the manufacturer, General Computing Corp.

The desk-top COM-24 retriever, said to be the first of a series of multipurpose readers designed especially for COM applications, is compatible with Recordak and 3M 16mm microfilm cartridges.

The unit, with a 14 by 14 inch nonglare screen, reportedly eliminates hot

spots through evenly dispersed intensity illumination. The viewer has a magnification factor of 24X.

A single lever with a variable low- to high-speed control advances film; a hand wheel provides manual slow speed scanning (in either direction) when required.

Priced at $850, the COM-24 is available on a one-week delivery schedule.

General Computing Corp. is located at 444 Park Ave. South.

New Books

Applied Numerical Methods, by Brice Carnahan, H.A. Luther, and James O. Wilkes, John Wiley & Sons, Inc., 604 pages, $14.95.

Intended to be an intermediate treatment of the theory and applications of numerical methods, the main feature of the volume is that the various numerical methods are not only discussed in the text but are also illustrated by documented computer programs. Many of these programs relate to problems in engineering and applied mathematics.

The reader should gain an appreciation of what to expect during the implementation of particular numerical techniques on a digital computer. Although the emphasis is on numerical methods (in contrast to numerical analysis), short proofs or their outlines are given throughout the text. The more important numerical methods are illustrated by worked computer examples. The programs are written in Fortran-IV and have

been run on an IBM 360/67.

Basic Ideas, by Dr. Robert E. Smith, $5.95.

This is a new training manual for the conversational Basic language. The book is designed to allow the student to interact with both the computer and the manual, using it as a self-teaching guide or a classroom text. The individual lessons consist of a problem, a flowchart of the problem, and the correct answer. The student is expected to write the program in the Basic lan-

guage to arrive at the solution.

"*Information Processing for Management*," by Donald G. Milne, John W. Haslett, and Dale Reistad, Business Press International, Inc., 176 pages.

A reference source for company and school libraries, it contains overview of the state-of-the-art in information processing. It covers subjects ranging from the role of the computer for management information systems to systems breakthroughs in varying concepts and machines.

IBM: Programming and Computing, by James T. Golden and Richard M. Leichus, Data Processing Book Service, $5.95.

Using a large number of examples to help the reader improve his programming and operating skills through the use of the IBM 360, the authors show why a particular facility is needed. The reader is introduced to the programming techniques needed by coding a representative sample of the system. The manual explains which I/O channels to use and when; the use of subroutines instead of macros; advantageous use of the computer's storage ability; generation of multiprocessing algorithms; and which data packing codes are best for each problem.

Programmer's Guide To The IBM System/360, by John H. Bradley, McGraw-Hill Book Co., 336 pages, $13.50.

This book concerning the System 360 has illustrations and flowcharts running the gamut of hardware to software, and a specially designed layout sheet providing practice in the specific instructions of data translation. The author provides an in-depth analysis of several instruction sets and asks the reader to try them on problems.

Every chapter is concluded with a round of questions and the reader can check his answers with the author's. Covering binary arithmetic in one chapter, reviewing decimal arithmetic in another, the author explains how to use the standard instruction set as well as the decimal instruction set.

Techniques are given for converting, scanning, and editing data, as well as tips on program maintenance that may be new even to experienced programmers. The author tells the reader how to decipher the interruption code as part of an exhaustive

treatement of the program status word and how to cope with a wide range of program troubles. He also gets down to the fundamentals of trouble prevention — program documentation, the operator's run book, the prototype test, and checkpoint and restart procedures.

Annual Review of Information Science and Technology, by Carlos A. Cuadra, Editor Volume 4, Encyclopedia Britannica, Inc. 568 pages, $16.00.

The editor and authors have attempted to produce a comprehensive and technically sound progress review for the information science field. The primary emphasis of Volume IV of *Annual Review of Information Science Technology*, like its predecessors, continues to be on published literature and reports.

Several new areas of growing importance are introduced. For the first time there is a chapter on the international aspects of information transfer. Full and separate chapters have been devoted to document dissemination and the secondary services.

Hewlett-Packard Chops Expense
Of Computer Aided Instruction

PALO ALTO, Calif. – An educational time-sharing system being offered to schools by Hewlett-Packard may herald the widespread use of computer-assisted instruction in the public schools.

Designated the HP/CAI system, it provides mathematics drill and practice for grades one through six at a cost of "about $150,000" for a typical 32-terminal installation, according to the company. This compares favorably with the significantly higher prices of previously available "centralized" systems.

Hewlett-Packard says that the educational system, a modified version of the HP 2000A time-shared system, is capable of operating up to 32 student terminals simultaneously.

The central processor is an HP 2116B with a memory capacity of 16,384 words. For mass storage, the system uses a drum or disk memory.

minutes of drill on the teleprinter each day, with instruction either self-paced or group-paced.

In addition, complete student records are maintained and reports for teacher · use are generated.

Because the program does not fully utilize the system, any terminal not in use for the math program may be used for general problem-solving, according to Hewlett-Packard.

The firm notes that existing HP 2000A systems can be field-modified to the expanded educational version.

Currently installed and operating at the Willow School in East Palo Alto, the system is now scheduled for general availability in time for classes next fall.

For teachers, Hewlett-Packard is also offering in-service training and additional curriculum aids.

It's all part of math class for students at the Willow School, East Palo Alto, Calif. Hewlett-Packard's CAI system permits drill and practice sessions for up to 32 children at a time.

Education

In the educational version, an HP 2114B minicomputer, is used to handle the terminal input/output processing for the central processor.

Terminals can be wired directly to the computer system within a radius of one mile, reducing operating costs and some of the problems associated with data transmission. A Hewlett-Packard spokesman noted, however, that by using acoustic coupling devices, some of the terminals can be located beyond the "one-mile limit."

As needed, additional systems can be added in modular fashion, he said.

The HP/CAI curriculum utilizes the Stanford Project Drill and Practice Program in Fundamentals of Arithmetic for grades one through six. Written in Basic, the program was initially developed under the direction of Dr. Patrick Suppes at Stanford's Institute for Mathematical Studies in the Social Sciences.

Presented by teleprinter, the material for every grade level contains 24 concept blocks, each containing seven lessons (a pre-test, five main lessons, and a post-test). Each main lesson is available at five levels of difficulty. The system selects the appropriate level, based on the student's earlier performance.

Each student receives from five to ten

Nationwide Terminals
To Link Student Body

LONDON - By early 1971, Britain's Open University expects to install between 100-200 time-sharing terminals in study centers throughout the country, provide computing facilities for about 8,000 students.

The university, inaugurated in 1969, is intended to provide higher educational courses to working persons unable to enroll in a full-time course of study. In keeping with this purpose, mobile terminals may be purchased in order to provide data processing facilities to those living in remote areas.

It is expected that each student will use between five and ten hours of terminal time per academic year, mostly during the evening hours after work.

Initially, the centers will be linked to systems operated by commercial service bureaus. Eventually, however, the university hopes to provide a computer network for all its educational needs by using the facilities for its students during evening hours and for other schools and technical colleges during the day.

The Open University is based at Walton Hall, near Bletchley, Bucks.

▓▓ **COMPUTERWORLD**

societies

Software for Banks Feature Item Of Loan Automation Workshop

NEW YORK – The Loan Au-
tomation Workshop, cospons-
ored by the American Bankers
Association (ABA), the Bank
Administration Institute, and
Robert Morris Associates, will
feature discussions of currently
available commercial, install-
ment, and mortgage loan soft-
ware packages.

Scheduled for March 8-10 in
Houston, Texas, the workshop
presentations will be made by
the independent software firms
and banks that are selling the

packages. Both producers and
users of the loan software pack-
ages will be on hand to answer
questions, according to the
ABA.

The workshop is expected to
attract more than 400 loan of-
ficers, data processing managers,
and senior systems personnel.

Firms and banks wishing to
offer software packages at the
workshop may contact James M.
Adams, director of automation
education, The American Bank-
ers Association, 90 Park Ave.

Hospitals Share Bug Information With Cooperative NCR User Group

DAYTON, Ohio – A number
of hospitals using NCR equip-
ment have formed the Coopera-
tive Hospital User Group (Chug)
to share information about their
installations and applications.

Originally organized in August,
1969, the group has now adopt-
ed bylaws and will elect officers
at an upcoming meeting here
April 7-9.

An NCR spokesman said that
the group currently has about 25
members, with a potential mem-
bership of nearly 200. Member-
ship is open, he said, to any
hospital using NCR data proces-
sing equipment, regardless of size
or hardware configuration.

Robert L. Willett, associate
hospital administrator at the
Kettering Medical Center, Ket-
tering, Ohio, is acting president.

Profession's Big Guns Eye Ethical Targets for EDP

WARRENTON, Va. – Present
and projected needs for profes-
sional competence and ethical
behavior in the computer field
were the primary topics at a
recent two-day, high-level meet-
ing sponsored by the American
Federation of Information Pro-
cessing Societies (Afips).

The conference, held Jan.
21-22 at The Airlie Foundation
Conference Center, brought to-
gether leading representatives
from industry, law, commerce,
finance, education, consulting,
and the professional societies.

Under the chairmanship of Wil-
lard Wirtz, former secretary of
the Department of Labor, the
interdisciplinary group devoted
most of its attention to job
requirements in the EDP field,
ethical conduct of the industry,
measurement of individual profi-
ciency, accreditation procedures
for vocational institutions, statis-
tical research covering employ-
ment, and the need for informa-
tion programs directed to the
public.

Interfacing with People

The discussions also coverd
specific sensitive topics that fre-
quently represent the public's
experience with data processing
systems. These included an erra-
tic control; billing systems; don-
tier-type systems, such as credit
bureau files; commercial time-
sharing systems; and systems
storing data of critical value,
such as vote tabulating systems.

The particular needs and activi-
ties of such organizations as soft-
ware firms, service organizations,
and educational institutions, in-
cluding private EDP schools,

were also examined.

In addition to Wirtz, partici-
pants included Dr. Richard I.
Tanaka, president of Afips;
Richard G. Canning, Afips secre-
tary; Dr. Bernard A. Galler, pres-
ident of the Association for
Computing Machinery; Dr.
Bruce Gilchrist, executive direc-
tor of Afips; Roderick Hills of
the Harvard Law School; Robert
H. Kinderman, vice-president,
Allied Chemical Corp.; Herbert
Koller, executive director and
of the American Society for
Information Science; James R.
Bradburn, executive vice-presi-
dent of RCA Information Sys-
tems; and Prof. Gerald L. Engel
of Hampden-Sydney College.

Also represented by "observing
participants" were the Society
for Information Display, the
IEEE Computer Group; Simula-
tion Councils, Inc.; the National
Bureau of Standards; the Associ-
ation for Computational Linguis-
tics; the Data Processing Manage-
ment Association; and the Amer-
ican Institute of Certified Public
Accountants.

'A Major Step'

According to Tanaka, "The
meeting marks a major step in an
ongoing study by Afips of the
overall needs for professionalism
in the computer field."

Conclusions and recommenda-
tions are currently being formu-
lated based on the various view-
points expressed during the
working session, he said, and will
be made public shortly. In addi-
tion, Afips plans to publish a
more comprehensive summary
of the meeting by late spring or
early summer.

Calendar

March 2-6, Houston – A five-day seminar entitled "A Guided
Tour of Linear Programming," presented by Control Data Corp.
Contact: Control Data Corp., Data Services, 8100 34th Ave. S.,
Minneapolis, Minn. 55440.

March 3-4, New York City – A two-day workshop in Accurate-
ly Defined Systems taught by Bruce L. Lee, manager of systems
and programming for Riggs National Bank in Washington, D.C.
Contact: Ed Schaffer, Marketing Manager, Computer Manage-
ment Sciences, Inc., 1316 Fenwick Lane, Suite 1208, Silver
Spring, Md. 20910.

March 11, Toronto – The Association for Systems Manage-
ment's annual spring conference, Systems for the Seventies.
Contact: Association for Systems Management, P.O. Box 29,
Toronto-Dominion Centre, Toronto 1, Canada.

March 11-12, St. Louis, Mo. – A meeting of the NCR Century
Products Users Group (CPU). Contact: William Huested, Filter
Dynamics International, 18451 Euclid Ave., Cleveland, Ohio
44112.

March 12, Washington, D.C. – A lecture organized by The
Johns Hopkins University and the Brookings Institution entitled
The Regulatory Process. Contact: Computers, Communications,
and the Public Interest, 1775 Massachusetts Ave., N.W., Washing-
ton, D.C. 20036.

March 12-13, Ottawa, Canada – The Honorable Eric Kierans,
minister of communications will be the keynote speaker for the
Canadian Industrial Communications Assembly. Contact: A.F.
Sherwin, 1st Vice-President, c/o Ontario Hydro, 620 University
Ave., Toronto, Ontario.

March 13, Phoenix, Ariz. – The Phoenix Chapter of the
Association for Systems Management's conference. Contact: Bob
Coar, Chairman, Southwest Systems Conference, Contact: P.O.
Box 13311, Phoenix, Ariz. 58002.

March 14-20, Vail, Colo. – The first one-week school for
Ruggednova users. Laboratory practice included. Contact: Rolm
Corp., 10925 N. Wolfe Road, Cupertino, Calif. 95014.

March 18-19, Atlanta, Ga. – Spring meeting of the Association
of Scientific Information Dissemination Centers (Asidic), Riviera
Motel. Contact: Mrs. Marilyn T. Brown, Secretary, Asidic, The
Dow Chemical Co., Midland, Mich. 48640.

Predicts IBM Sale of $150 Million Unbundled Software

NEW YORK — "IBM will probably sell about $150 million of proprietary product software in its first year in the marketplace. Independent software firms sold only $20 - $25 million in 1969," according to L.A. Welke, president of International Computer Programs Inc.

"This is the impact of unbundling. Computer manufacturers who were originally forced into software as a means of selling their hardware are now going to capitalize their investments," Welke told representatives of the nation's largest firms at a recent software seminar here.

"Software users will split into two groups: the unsophisticated, relying solely on the manufacturer for his hardware and software; and the sophisticated, buying from an independent or forming his own software firm to provide services to his total corporation.

"We can count more than 30 of the Fortune 500 firms who are providing computer services to the public. Some became involved through a spin out, merger, acquisition or just normal diversification within the conglomerate. As divergent as their activities, all have a proprietary product or two for public consumption. It seems to be a legitimate way to approach the marketplace," Welke said.

Dr. William Gordon, chairman of the board of the Boston Computer Group,

Inc., stressed the need to look upon computer software as a product rather than a service.

"Software products," said Gordon, "properly designed for in-house use and presently being sold, do not always meet the requirements of the mass manufacturer.

"Documentation for the end user," continued Gordon, "is the most important element that seems to be missing when such in-house programs are placed on the market. Documentation is needed for the direct use of a computer program, for sales assistance, and for maintenance of that product."

Moving on to the problems of marketing computer-program products, William S. Grinker, executive vice president of the Boston Computer Group, cited the need to determine whether a program is indeed a product as opposed to a service before approaching a marketplace.

"The mechanics of selling software," Grinker said, "are as follows: first the program must be classified (product or service); the market must be identified as

to the type of user and how much that user will pay for software; and finally, a distribution approach must be developed."

A detailed three-year study presented by Grinker indicated that the greatest expenditure in today's marketplace is the cost of sales and the maintenance of those sales rather than the initial cost of development.

Adolf F. Monosson, president of the Boston Computer Group, Inc., stressed the chaotic conditions of the marketplace, especially the lack of prudent business judgment in the software industry. Monosson said, "The ability to build a good packaged program is generally in conflict with the discipline of running a successful business venture."

He also questioned the accounting practices of some of the leading software firms, drawing an analogy to computer leasing accounting practices, noting that some of the accounts receivable of the packaged software firms may not be true receivables and consequently the actual sales volume may be over stated.

SDC Cited for Training of Blind

SANTA MONICA, Calif. — System Development Corp. (SDC) has been awarded The Citation for Meritorious Service by the California Governor's Committee for Employment of the Handicapped. SDC was awarded the citation for its training and placement of visually handicapped computer programmers.

For the last four years, under the sponsorship of the California Department of Rehabilitation, SDC has given the blind and partially blind an opportunity to become skilled programmers. Students at SDC have demonstrated unusual abilities compensating for their visual handicap, such as remarkable memory ability, intense concentration, and strong analytical abilities.

Graduates from SDC's intensive eight-month computer programming course have been widely accepted in the computer and data processing industry. More than two-thirds of SDC's 40 graduates are currently employed as programmers.

The course, conducted at corporate headquarters in Santa Monica, introduces the students to basic concepts of system analysis and design, then gradually moves into more sophisticated areas. In the final portion of the course the students work on the corporation on research projects, getting the feel of real working conditions. Stewart added, "Graduates are able, with little on-the-job orientation, to design, test, and implement programs utilizing several computer languages, to solve difficult problems."

Minnesota Boasts of DP Prowess

By Edward J. Bride
CW Staff Writer

ST. PAUL, Minn. — Trumpeting their state as the "hotbed of the computer industry," Minnesota officials are boasting one of the most advanced and successful centralized state data processing operations in the country.

Governor Harold LeVander, who recently established an independent computer service bureau, believes that Minnesota is "on its way to becoming the number one state in the country in computerization."

After a year-long study completed in the end of 1969, Governor LeVander this month issued the executive order to centralize the state's computer operations.

This order establishes the human under the direct control of the state administrative officer, but the chief executive wants the computer center to be "as independent as possible."

Assistant Director of Computer Services George Kiefer told CW that a study taken by business leaders ("top administrators") should be prepared for submission and review by the legislature some time next year.

However, he was quick to point out that the state had been preparing for centralization since 1957, and already owns much of the equipment needed, including two IBM 360/50s, a 40 and a 25, plus a Univac 418 for communications.

Much On-line Already

Already on-line is the Minnesota Crime Information System, reportedly one of the most advanced in operation, and comprised of 122 stations.

Also included in the centralization are more than 100 state agencies and a junior college. There are plans to install a regional center for three state colleges and school districts.

Orders and Installations

Scotland Yard, the British law enforcement agency, has ordered a $4.8 million Burroughs B6500 system. The purchase of the B6500 is the initial hardware acquisition for a massive $40 million information network which will enable police throughout England, Scotland, and Wales to have immediate access to records of stolen vehicles and other property, central files of criminal's fingerprints, information on missing persons and other information necessary for law inforcement. Scotland Yard plans to use about 800 terminals, located throughout England, Scotland, and Wales, to send and receive information from the B6500 central system.

Financial Computer Services, Inc., Fremont, Ohio, has placed a $5 million order with Burroughs. The order consists of two B3500s, 150 TC700 electronic teller terminals, 100 TC500 electronic terminal computers, 47 B606 electronic teller consoles, 15 S100 and 35 S200 proof encoding machines. Bright & Schiff of Dallas has also installed a Burroughs B3500 system valued at more than $700,000.

The first power generating station computer system for the Republic of South Africa was ordered by the Camden Power Station of South Africa's Electricity Supply Commission. The system, a Control Data 1700 and a large array of analog and digital interface equipment is designed to read about 400 analog signals representing temperatures, pressures, flows, and other critical operating parameters.

The U.S. Atomic Energy Commission (AEC), will install a Control Data 6400 at the AEC atomic test site in Nevada. Major contractors to the AEC Nevada operations will use nine CDC 1700 computers as remote terminals, or satellites, to the central computer. A communications control buffer at the central computer site will channel the data from the 1700s into the 6400 for computation and return the results to the correct terminal.

Phillips Petroleum has installed a Redcor RC 785 data acquisition system to be used in exploration and production research activities.

International Computer Graphics, Inc. (ICGI) of Dallas has installed two Calma Model 485 graphical to digital digitizer systems. For use with ICGI's CDC 1700, the Calma 485s are equipped to convert either whole-value or incremental digitizing with VIP mode operation.

The Medical Arts Center Hospital, N.Y., has purchased Medic, the new on-line hospital information system from Gamut Systems, Inc., N.Y. Medic will enable the hospital's business and financial personnel to maintain up to the minute billing information on all patients.

The Southwestern States Bankcard Association (SSBA) has leased an OCR from Recognition Equipment Inc., Dallas, for automatically processing credit card sales tickets and statements. The system will optically read account numbers and amounts from credit card charge tickets, translate the information into computer language, and record it on magnetic tape for use by SSBA in its billing operation.

General Electric Co. has ordered a computer-driven display system from Sanders Associates Inc., Nashua, N.H., for its Electronics Laboratory in Syracuse, N.Y. The system will be used to explore the use of computer graphics in engineering design and to investigate the development of new display techniques. The Sanders Adds 900 Advanced Data Display System will also be employed by G.E. engineers to develop design automation and pattern recognition techniques, as well as simulations and studies of man-machine interfaces.

A NCR Century 200 was installed at Ford Motor Co.'s vinyl and paint plant, Mt. Clemens, Michigan, which will enable the overall inventory control and forecasting program to keep pace with the plant's growing volume. The NCR Century 200 was also installed at Kettering Medical Center, Kettering, Ohio, which is made up of the Charles F. Kettering Memorial Hospital and the Kettering College of Medical Arts. Applications will include students' grade and attendance reporting, in-patient accounting, accounts receivable, payroll, and general ledger.

The Herald-News of Passaic, N.J., has installed a Univac 9200 system for use in preparing circulation and advertising reports, dealer and carrier billing, payroll processing for 400 employees, and general accounting applications. Regal Manufacturing Co., Hickory, N.C., has also installed a Univac 9200. Applications encompass billing, general accounting, payroll processing, sales analysis, and inventory control.

Sanco Computer Services of London, England, has ordered a large-scale General Electric GE-615 information processing system from GEIS, Ltd. The $2 million system provides bureau services for the Associated Companies and other users.

Five recent orders for the Score Cobol program generator/information retrieval and reporting system have been reported by Atlantic Software Inc., Philadelphia, and Programming Methods Inc., New York City. To date over 60 installations are operational using the Score system, they say.

Scandinavian Airlines has inaugurated Sanco 11, the largest real-time control system in Europe. The system centers around three Sperry Rand Univac 494 computers, and provides a totally integrated reservations and management information system.

Burroughs computers have been ordered or installed at three banks and a bankers service bureau for a variety of banking applications. Burroughs B350 systems have been installed at the American National Bank & Trust Co., Bowling Green, Ky., and at the Bankers Data Services Inc. of Houston. B500 electronic data processing systems have been ordered by the Peoples Bank and Trust Co., headquartered at Rocky Mount, N.C., and installed at Tower, Data Processing, a division of Tower National Bank of Lima, Ohio.
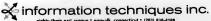
Computerworld ON THE LIGHTER SIDE
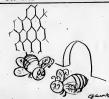
"Just Between Us, Mr. Frimbly – How Would You Evaluate My Work . . . Average? Less Than Average? Better Than Average?"

"What Does Your Built-in Computer Say the Distance to the Clover Is Today?"

"YUKKSCH!"

"We've Been Feeding It the Pollution Problem . . ."

"If There's Anything That Gives Me the Creeps, It's an Auditor Who Keeps Going 'Tch, Tch' . . ."

"I've a Funny Feeling He Won't Be Cheap!"

"You Run Into *Some* Characters in This Business . . ."

Senate Small Business Report Is Criticized

By Edward J. Bride
CW Staff Writer

WASHINGTON, D.C. —A Senate small business committee report is coming under fire for recommending subsidies to "bridge the technological gaps" between small business and the computer.

The president of a small New York service bureau has issued sharp criticism of the report, claiming that "a solution to this problem exists today," in the form of the independent data processing service bureaus.

The Select Committee on Small Business says that resources must be "marshaled and subsidized. . . to meet the sophisticated challenge of the computer."

The report warns that small business must have access to "all of the skills and equipment now available to big industry" in order to "survive and flourish in a highly competitive marketplace."

But Joel Bernstein, president of Information Standards, Inc., says that the skills and equipment are already available, and charges that government subsidy would be "uncalled for and abhorrent to the principles of free enterprise."

Adapso Agrees

Jerry L. Dreyer, executive vice-president of the Association of Data Processing Service Organizations (Adapso), agrees that service bureaus are the answer to the small businessman's need for computerization.

He stated the various services available through the 800 to 1,000 centers preclude the need for subsidies.

Dreyer said he agreed with Bernstein's estimate of "100,000 regular service bureau customers" in the U.S. last year.

The committee says it has long been recognized that a gap exists between computer technology and "small business know-how," but efforts to solve this problem have been "unfocused and lacking in continuity."

A spokesman for the Senate committee said that Bernstein's letter was referred to the Science and Technology Subcommittee, which is currently conducting hearings. No further comment was available.

A spokesman for the Small Business Administrator, which Bernstein indicated had been sent a copy of the letter, had no record of the correspondence.

Acquisitions

Growth Industry Computing, Inc. of Los Angeles, has acquired **Comps Inc.** of Orange, Calif. Growth is composed of marketing professionals, market research experts, and computer scientists dedicated to advanced market techniques utilizing computer technology. Comps is a computerized data publishing organization that offers marketing products to individuals and corporations that deal in sales and services in the western U.S.

Western Operations, Inc., San Francisco computer planning and management firm, has acquired **Information Systems Management Corp.** of Richland, Wash., as a subsidiary. ISM designs and develops data management systems that automate the costly and time consuming tasks of computer systems design, program design, coding, and testing.

Nytronics, Inc., Pelham Manor, N.Y., has entered into an agreement and plan of merger with

Diversified Data Services and Sciences, Inc. Under the merger, one share of Diversified Data stock outstanding on the effective date will be exchanged for three-quarters of a share of Nytronics capital stock, plus warrants to purchase additional capital stock of Nytronics to bring the value of the total package on the date of closing to $12.50. If the value of three-quarters of a share of Nytronics stock on the date of closing equals or exceeds $12.50, no warrants would be issuable. No more than two warrants will be issued as part of the package. Nytronics manufactures electronic components for use in computers, missile control systems, communications equipment, and industrial control devices. Diversified Data provides various data processing services.

Cybermatics Inc., Fort Lee, N.J., has signed a definitive merger agreement with Carci

Computab Systems Inc., embodying the terms of the previously announced agreement in principle. Cybermatics will issue .46 of a share of its common stock for each of the 191,775 publicly held shares of Carci common stock. Additional shares of common stock will be issued if the average value of a share of Cybermatics during the ten trading days prior to the shareholders meetings is between $8 and $10.84, so that, based upon that value, public shareholders will receive not less than $8 worth of Cybermatics stock. Cybermatics is a software company serving as a general systems contractor and supplier of on-line systems and computer based services. Carci Computab manufactures and sells continuous, single, and multi-copy business forms used in computer systems.

Micromation Technology Corp., Chicago-based information technology company, has

completed the acquisition of LV Computer Systems, Inc., New York, a company that developed and is marketing the LV 3000, an on-line, real-time minicomputer providing financial data analysis systems covering all NYSE and AMEX listed stocks. Micromation acquired 100% stock ownership of LV Computer Systems in exchange for Micromation common stock.

Fisher-Stevens, Inc., Clifton, N.J., a direct mail and data processing service organization, has acquired Advertising Distributors of Washington, a firm providing computerized direct mail services with headquarters in Beltsville, Md.

Executive Computer Systems, Inc., Oak Brook, Ill., has acquired the business and assets of Occidental Computer Corp. of Riverside, Calif. Capabilities offered through the Occidental Division of Executive Computer Systems are: buying, selling, and

leasing of computer equipment; systems design and implementation; processing service in the medical and publication field through their information center; site selection and facility construction; personnel procurement; and executive education.

Datatron Inc., Santa Ana, Calif., has signed an agreement in principle to acquire Bouse Manufacturing Co., also of Santa Ana, for an undisclosed amount of common stock. Datatron manufactures high performance timing instrumentation, computer-controlled test equipment, digital data systems, broadcast devices, and IBM compatible disk packs. Bouse produces electronic chassis, computer-type consoles, and equipment enclosures.

Financial Technology Inc., a Dallas-headquartered computer firm, has acquired approximately 80% of Comtec of New Orleans, a computer time-sharing corporation.

Contracts

Integrated Automatic Systems Corp. of New York was contracted by Realdata Corp, Somerset, N.J., to provide its professional services as systems consultants and planners for the preparation of studies, analyses, and general proposals relating to Realdata's service programs for its data processing client.

Cetec Corp., Mountain View, Calif., has entered into a $242,000 contract with Nasa/Lewis Research Laboratory of Cleveland, Ohio. The contract involves a 15-month theoretical and experimental evaluation of aft end ignition as a means to further define and control the nozzle flow field of solid rocket motors. This concept was appli-

cation over the entire spectrum of solid propellant motors from small tactical rockets to large space boosters.

Sanders Associates has been awarded a $3,793,838 contract by the Naval Air Systems Command for classified electronic equipment.

Management Systems Corp., a Dallas subsidiary of American Biomedical Corp., has signed a three-year, $500,000 contract with Geledata Systems to provide computer time and facilities.

Nuclear Associates International Corp., Rockville, Md., under contract to Jersey Central Power and Light Co., will provide con-

sulting services for a system that will monitor reaction performance using an on-line computer. The system will interface with plant instrumentation signals to perform data logging functions and process the data.

Dacom, Inc. was awarded a contract from Dow Jones & Co. to add a digital data compression system to the newspaper facsimile terminals presently being used to transmit the full-page proofs of the *Wall Street Journal* from its publishing plant in Palo Alto, Calif., to its printing plant in Riverside, California. The Dacom data compression system substantially reduces the communication channel requirements while maintaining the

high quality text and half-tones of the present facsimile.

Computer Data Enterprises, Inc., Jenkintown, Pa., has been awarded a contract for systems software by Dialog Computing, Inc. Dialog Computing will run the programs on its time-sharing computers to provide service to its customers in Connecticut, Ohio, Pennsylvania, Indiana, Illinois, Massachusetts, and New York.

The use of computer and data processing subscription fulfillment led to a contract between International Computer Sciences Inc. of Neptune, N.J., and Ziff-Davis Publishing Co. Under the contract that will exceed a quarter mil-

lion dollars annually, International Computer Sciences Inc. will handle the subscription fulfillment function on all of the firm's trade publications.

The U.S. Atomic Energy Commission, Nevada Operations Office, has awarded Control Data Corp. a contract to install a large remote terminal computer system at the AEC atomic test site in Nevada. The main computer facility will be a Control Data 6400 computer.

A $100,000 contract from Philco-Ford Corp. has been awarded to Electric Computer Corp. of Dallas for 13 Model 640 tape systems. These tape systems will be used in computer systems to help the Post Office.

VP Hadad Directs IBM Poughkeepsie Lab

WHITE PLAINS, N.Y. — IBM has named Jerrier A. Haddad, an IBM vice-president, to the position of director of its Poughkeepsie, N.Y., systems development laboratory.

In his new position, Haddad will be responsible for development activities in Poughkeepsie and for assuring overall coordination of systems and programming development for IBM's Systems Development Division. He previously had corporate staff responsibility for engineering, programming, and technology.

Erich Bloch, who was director of the Systems Development Division laboratory at Poughkeepsie, has been promoted to vice-president, operations, for the company's Components Division. Bloch will be responsible for development and manufacturing of electronic components used in IBM's commercial data processing equipment.

Haddad, who holds 18 patents for inventions in the computer and electronics field, was elected in 1968 to membership in the National Academy of Engineering. He is a member of the computer science and engineering board of the National Academy of Sciences, and a Fellow of the Institute of Electrical and Electronics Engineers. He is on the board of trustees of Clarkson College of Technology.

Haddad was graduated from Cornell University with a B.S.E.E., and serves as a member of the advisory council of that university's College of Engineering.

Since joining the company in 1952, Bloch has held a number of technical management positions including manager of the Solid Logic Technology program, manager of corporate memory development, and director of large systems.

Bloch is a graduate of the University of Buffalo with a B.S.E.E. He holds six patents in the components field and is a senior member of the Institute of Electrical and Electronics Engineers and a member of the American Association for the Advancement of Science.

Packer Named V.P. at Recognition Equipment

DALLAS — Recognition Equipment Inc., Dallas, has formed a corporate research function for its group of companies and has named Dr. Leo S. Packer, formerly Assistant Postmaster General for Research and Engineering, vice-president to direct the new function.

Packer and his group will be responsible for research and development for Recognition Equipment and its affiliate and subsidiaries.

At the U.S. Post Office Dept., Packer directed all research and development programs for new mail processing equipment from 1966 to 1969 and was responsible for architectural and engineering programs for new postal facilities.

He also served as a special consultant to the National Aeronautics and Space Administration to study methods of directing existing space technology to help solve problems of man's environment.

Prior to his Presidential appointment with the Post Office Dept., Packer was associate director of the Information Systems Division of Xerox Corp. and served with the Space and Defense Division of Bausch & Lomb, Inc., as division manager.

Executive Corner

From 1949 to 1959 he headed the Instrumentation Section of Cornell Aeronautical Laboratory, Buffalo, N.Y., where he directed research and development programs on government and commercial contracts.

Packer received the doctorate in engineering mechanics from Cornell University and holds a master's degree in engineering sciences from Harvard University.

Van Paddenburg Rejoins CSC as V.P. Applic. Div.

LOS ANGELES — Jack C. Van Paddenburg has rejoined Computer Sciences Corp. as vice-president-applications development for CSC's recently formed Development Division, based at El Segundo, Calif.

Van Paddenburg will direct the development of the new computer-based systems and applications packages which CSC will market on a proprietary basis. One of his major responsibilities will be the development of the numerous applications packages required by CSC's information network service, known as Infonet.

Van Paddenburg has been engaged in the computing industry for more than two decades. In that period he has been responsible for the management of a broad range of developmental and operational functions for some of the largest concerns in the field.

Most recently, Van Paddenburg

has been concerned with the development and management of computer-based, on-line information systems.

Prior to his new appointment, Van Paddenburg was director of computing and data systems services for North American Rockwell Corp.'s Space Division at Downey, Calif.

Van Paddenburg was manager of Computer Sciences' southwest operations when he left CSC in 1966. In that capacity, he directed the activities of company personnel at facilities in Los Angeles, San Francisco, and San Diego.

Other Moves

● James E. Rowe has been appointed vice-president of the Information Science Division of Computer Applications Inc., New York. Rowe will direct the division's activities in facilities management in the industrial and governmental markets.

● Frank M. Mina has been named president of Datadial Systems Inc., Smithtown, N.Y.

● Marine Digital Systems, Inc., Plymouth, Mass., has announced that Thomas D. Mara has joined the company as a vice-president and will head the newly created research and development department. His responsibilities will include the definition of marine bridge control requirements and concepts, evaluation of integrated computerized marine systems, operational tests, and the development and operation of simulation facilities.

● Computer Business Consultants, Inc., Chicago, has named William R. Snyder to the position of executive vice-president in charge of operations.

● Computran of Birmingham, Mich., has elected John L. Wallen president.

● Larry E. Reeder has been appointed vice-president of marketing for Computer Corp. of America, Cambridge, Mass.

Binary Systems, Inc. Formed to Develop Binar Reader

SAN FRANCISCO — Binary Systems, Inc. has been formed to develop and market the Binar reader, a concept of collecting point of sale information for stores.

The reader can be placed on the sales desk in various store departments. When a sale is made, the tag on the merchandise is placed in the slot of the reader, and the information on the tag is transferred to a tape cassette. At the end of the day, or week, the tape is collected and passed through a converter at a computer center, providing sales, inventory, and other needed information.

"In present department store operations, every piece of merchandise must have a ticket of some kind attached, so our system is not adding any additional steps to the operation. Binars appear to the eye as block numerals. The numerals can be printed in any size and can be used on any information source," said John J. Reilly Jr., president of the new firm.

He said only a minor modification of present printing machines would be needed, the substitution of a type band in the Binar font.

★ Proprietary Computer Services, Inc., Encino, Calif., is a new computer service company specializing in computer processing of specific and original proprietary programs as well as systems analysis, computer programming, facility management, and consulting.

Initially, the company's sales and marketing efforts will emphasize proprietary services and products related to law office accounting, land investment and property management accounting, manufacturing systems, and questionnaire survey processing.

★ Systems Management, Inc., a new company, was created to help client firms overcome some of the day-to-day problems of running a computer installation.

Initially, SMI will provide services in four fundamental areas: organizational structure, standard operating procedures (including operations documentation standards), personnel policies and procedures, and physical facilities.

In any or all of these categories, SMI services range from general weekly consulting to long-term operations management studies.

Later services are to include automated scheduling, utilization and exception reporting, work load analysis, and optimization and peripheral mix analysis.

The goals of all SMI consulting will be to improve: work flow and control, interdepartmental and/or customer relationships, job throughput, employee morale, and organizational structure to reduce operating costs.

★ Arlington Computer Enterprises, Inc., a data processing and computer programming company, has been organized and has opened a data processing center at 212 W. Main in Arlington, Texas.

The new business is affiliated with Data Tab Keypunch Franchises, Inc. of Dallas.

Equipped with IBM keypunch and verification equipment, the new firm will provide Dallas, Fort Worth, and mid-cities area businesses with keypunch services and programming on an hourly or complete job basis.

★ A new company, Computer Digital Systems, Inc., has been formed in Norristown, Pa.

New Companies

Its business will be to design and manufacture peripheral devices compatible with the recently announced small 96-column card by IBM.

The company is currently in the development phase of these products.

★ A new company in the computer services field has begun operations. The firm, Eric Knutson Associates, Inc., offers management consulting, systems design, and custom software services.

Specialties include factory monitoring, control systems for continuous and batch processes, communications oriented systems, and project management services.

★ Katun Corp., a new computer management company, has been formed with headquarters in San Francisco.

Katun will be a "total resource" company with divisions in several disciplines.

The new corporation's first division, Katun Computer Management, has also been formed.

Katun will offer business expertise in all phases of data processing, from the creation of systems to total computer center management.

★ Applied Computer Marketing Corporation (ACMC) has been formed in Torrance, Calif. to provide professional sales and marketing within the computer industry.

Initially, the new firm will sell, service, and lease nationally a line of KDI interactive data system data communication products, disk controllers, and disk systems.

★ Decision Data Corp., headed by a team of former Univac management personnel, will design, manufacture, and market a broad line of peripherals, subsystems, and related auxiliary equipment.

★ Facility Management and Support, Inc. has been organized in the Chicago area by a group of former EDS systems engineers.

The primary purpose of FMS is to provide professional data processing facility management. FMS also provides operations, programming and systems design support.

★ Total Package Systems Corp., Los Angeles, specializes in the design and development of automated products and simplified software and terminal equipment for business and industry.

Corporate profitability and growth will be abetted through acquisitions of small, highly motivated, profitable companies involved in technology closely related to Total Package Systems Corp., the company says.

★ D.M. Systems, Inc., of Los Angeles, offers to assist clients in determining management information requirements, and then to assume the responsibility for satisfying these requirements.

This involves evaluating existing software, such as file management systems, inventory control applications, accounts receivable programs, etc., and selecting that combination which best supports the needs of particular projects.

In addition, a hardware evaluation may be made, which includes a comparison of in-house vs. service bureau operation.

They are located at 2100 Sepulveda Blvd., Suite 27, Manhattan Beach, Calif.

★ Computer System Architects Inc. has been founded in Cambridge, Mass., to satisfy system-architectural needs of companies developing computer-based products.

CSA will assist its clients in identifying product development objectives; in performing analysis, planning, and scheduling of development; in overseeing product realization through the preparation of product and test specifications; and in conducting design reviews.

★ A group formerly with IBM has joined forces to form Corstar Business Computing Co. in White Plains, N.Y.

Corstar will provide capability of creating customized management information systems and their related databanks.

Corstar's management information systems provide business executives with ability to plan, measure, and control their business through accurate, up-to-date information channeled from various company operations such as marketing, finance, manufacturing and production, personnel, inventory distribution, and others.

★ Redmar Associates, Inc. of Needham, Mass., is a newly formed digital manufacturers' representative selling computer peripheral equipment, digital memory devices and data communications products.

The company will serve the six New England states and will begin full operation in January.

★ A new management consulting firm, Decision Sciences Corp., has been formed in Jenkintown, Pa., to specialize in decision support systems used to aid management decision-making in government, business, and industry.

Decision Sciences utilizes advanced interrelated technologies such as systems analysis, econometrics, operations research, and behavioral research in conjunction with data processing systems.

These are applied to problems to identify and define the decisions to be made, and to develop systems to support the decision-making process.

Current applications are in strategic business planning, distribution and logistics planning and design, regional and urban planning, and in information systems planning.

★ Vendere International Marketing Corp., headquartered in Torrance, Calif., is a new national marketing and service organization for the information sciences and computer industry.

A national manufacturers representative for computer hardware, software; and peripheral equipment, Vendere also offers marketing consulting, planning, and product evaluation services to the many technically oriented companies in the industry.

Software for Sale

Expansions

Century Opens 2nd German Office

FRANKFURT — Century Computer Corp., U.S. company specializing in overseas markets, has established at Cologne its second German office and opened its first data center in Italy.

The Cologne office of the firm's subsidiary, Century Computer Deutschland, will receive a Honeywell 1250, disk and magnetic tape oriented, in March.

The Italian subsidiary, Century Computer Italia, SPA., occupies the entire eighth floor of a major office building in Milan at 33 Piazza Republica. It has a Siemens 4004/35 computer and has installed a RCA Spectra 70-35 which is disk and tape oriented. A second data process-

ing center for Milan will be announced shortly.

The Italian company also has set up a computer leasing subsidiary, Computer Europa Italia, SPA., which has an initial contract for $500,000 including two Century 100s and one NCR 500 with a 110% payout in five years.

The German subsidiary opened headquarters late last year in the Frankfurt suburb of Offenbach where it installed a Honeywell 200 with a 65K memory. With the addition of a Honeywell 1250, the firm will be the largest private data center in Germany, utilizing 16 tapes, eight disk drives and three printers.

Recognition Equipment Canada Opens New Office in Toronto

TORONTO — Recognition Equipment (Canada) Ltd., a wholly owned marketing subsidiary of Recognition Equipment Inc. of Dallas, has opened an office in Willowdale, a Toronto suburb.

Recognition Equipment Inc. is a manufacturer of large scale OCR equipment and markets its systems outside the U.S. through marketing subsidiaries such as Recognition Equipment (Canada).

Several leading Canadian organizations presently use or have ordered the company's electronic retina computing reader to prepare information for computer processing.

Scientific Resources Moves to New Corp. Hdqrts.

PHILADELPHIA — Scientific Resources Corp. has completed a 20,500-sq-ft addition to its Montgomeryville, Pa., office

building, which will now also serve as corporate headquarters.

The new building will be occupied by all corporate executives and the staff of Scientific Resources who formerly were located at 7320 Old York Road, Philadelphia.

The move consolidates company management and computer technology personnel on one 36,500-sq-ft facility. Significant economies and improvements in operating efficiency are anticipated as a result.

Land Resources Corp., a subsidiary, and Atlas Financial Corp., a former subsidiary of Scientific Resources, will continue to operate at the Old York Road offices.

Other Expansions

Universal Information Systems, Inc. of Paramus, N.J., a new computer services company, has opened corporate headquarters in the 4-17 building at the junction of routes 4 and 17. The company offers such computer support services as systems design, programming, time-sharing applications, data conversion, data center management and data processing education.

Comcet, manufacturer of computer communications systems, has opened its eighth and ninth field offices. The southwestern regional office is at 3110 Southwest Freeway in Houston, and a branch office is at 235 Braniff International Tower in Dallas. Comcet corporate and marketing headquarters are located at Two Research Court, Rockville, Md.

Data Devices, Inc., Tarzana, Calif., manufacturer of computer accessory equipment, has opened a southeast regional sales office. The office is located at 24 Executive Drive, Executive Park Northeast, Atlanta, Ga.

Applied Dynamics, Ann Arbor, Mich., manufacturer of scientific and special purpose computer systems, has opened a new sales office at 999 Woodcock Road, Orlando, Fla.

Lockheed Electronics Co. of Los Angeles has opened an office at 3390 Peachtree Road in Atlanta, Ga. The company is a supplier of ferrite core memory systems and multilayer and flexible printed circuit boards. Recent product announcements include plated wire memories and the MAC 16 computer for OEM applications.

The Air Force Systems Command has announced that Detachment 14, Headquarters Electronic Systems Division, has been established at Eglin AFB, Fla., to solve problems in the testing of ESD equipment at that base.

IBM World Trade Corp. will begin construction of a new IBM plant in Campinas, Brazil, this spring. The 220,000-sq-ft plant will be located on a 230-acre site 60 miles north of Sao Paulo. When completed in 1970, the new plant will manufacture products previously produced at the company's existing Rio de Janeiro plant. These are typewriters, key punches, and verifiers. IBM Brazil's headquarters and administrative offices will remain in Rio de Janeiro.

URS Data Sciences Co. has established a data processing center in San Mateo, Calif., at 155 Bovet Road, scheduled for occupancy early in April. Two medium-scale, general-purpose computers are now in operation, a Univac 9300 and 9400. The center is being run by the company's Facilities Management Division. It initially offers processing services to manufacturing, accounts receivable, accounts payable, general ledger accounting, credit union accounting, conversion services, and communications.

Levin Sues to Regain Reins of Levin-Townsend

By Michael Merritt
CW Staff Writer

NEWARK, N.J. – It seems to be the season for ousted company presidents to sue their former employers.

Last week G.W. Woerner, replaced president of Computer Technology, threatened action to block the takeover of CT by UCC. Now Howard Levin, bumped as president and chief executive officer of Levin-Townsend Computer Corp., last month, has gone to court to block his removal and seek "such . . . relief as the court may deem just and equitable."

Levin charged James E. Townsend, cofounder of Levin-Townsend and new president, and three other directors conspired in a secret meeting to remove him, and asked the court to rule that he is the lawful president and to enjoin the Levin-Townsend board from interfering with his exercise of his office.

Levin remains a director and owns 9.2% of the company.

The affidavits of Levin and Alfred W. Martinelli, the only director who sided with Levin, provide a dramatic picture of board room conflict. Martinelli's statement describes Townsend as interrupting a financial discussion by unexpectedly pulling some papers from his brief case.

"Mr. Townsend's hands were trembling and his voice was cracking as he commenced to read a typewritten resolution to remove Mr. Levin . . . 'without cause,'" Martinelli said.

Levin's statement charged that the four board members planned their action in secret six days before the board meeting, despite assurances that they supported him.

Since his removal, Levin added, he has been barred from his office and has been refused information about company operations, even though he remains a director and major shareholder.

Levin-Townsend refused to comment until it had time to study the complaint, according to Frank B. McShane, counsel and director.

Townsend's announcement of Levin's removal in January said that the "realignment" was necessary so that the company could concentrate on its computer leasing and real estate operations. Levin had diversified the company into ownership of a Las Vegas gambling casino and a restaurant and gift shop franchiser.

According to Townsend's statement the diversification caused a third quarter loss at Levin-Townsend.

Levin's affidavit repeated his earlier allegation that Townsend had tried to take control in March, 1969, but backed down. He said that until the Jan. 16 meeting his relationship with Townsend and the other directors was cordial.

Software Assn. Fails to Block Reissuing of Contracts to SDC

SANTA MONICA – Two new developments mark the controversy over System Development Corp.'s efforts to convert from a non-profit to a for-profit organization.

The California State Attorney General's office has acknowledged that it took exception to the terms of the agreement made by SDC with an investment group and the Air Force has moved ahead with novation of its contracts with the firm.

Novation is the legal term for reissuing a contract to a different party without changing its terms.

The Association of Independent Software Companies had objected both to the stock offering and the reissuing of the contracts on a non-competitive basis.

The attorney general's office previously refused to answer any direct questions about SDC and would only say that "there was no investigative action active or pending at the time." Dr. Robert Kreuger, president of Planning Research Corp. and an officer of the software association, called this a "cautious statement by a government agency."

A public announcement of the cancellation was never made by SDC or Lehman Bros.

The association objected on the basis that Lehman Bros. investment group would receive 31.3% of the total outstanding shares for $6.25 million with an option for additional shares at a price of $8 million, which would give them 56.3% of the total shares for an aggregate consideration of $14.25 million. According to the association's figures, based upon the average price/earning ratio of software firms, the aggregate market valuation of the firm should be $19 million to $28 million value placed upon SDC by its trustees and by Lehman Bros.

The attorney general's office concurred that the value placed upon SDC was too low to protect the public interest and said it could not approve it.

The other major contention of the software association was with the Air Force's awarding SDC contracts on a non-competitive and favored basis. The association believes that if SDC is to be for profit, all contracts should be let on a competitive basis.

The Air Force has just reissued $62 million in contracts to SDC in its new status as a for-profit corporation.

The association contends that SDC in the past has used the security and profits of its Air Force work to invest research and development in its commercial activities and to bid on commercial contracts at a loss in order to get business. Kreuger, when asked if there was any appeal to the Air Force going ahead with its SDC relationship, said that there was not, and the association had done what it could.

Astrodata Third Quarter Was Poorer Than Predicted

ANAHEIM, Calif. – Astrodata has reported third quarter losses even greater than the company predicted last month.

The quarter ended Dec. 26 showed a loss of $1.2 million while the similar period a year earlier ended in a profit of $151,000 or 10 cents a share.

For the nine months the company showed a loss of $63.3,000, compared with a loss of $39,000 a year earlier.

"A major factor" in the nine months results was the loss of $1.2 million to cover current and future costs of a communications system installed by Astrodata for an unnamed New York company, according to an Astrodata spokesman.

Operations other than this showed a profit of $538,000.

The third quarter also saw a 20% drop in sales volume over first-half levels and increased operating costs for the introduction of new product lines.

Astrodata President James A. Yunker said that "Recent events confirm again the uncertainties inherent in aerospace-defense business . . . ," and that Astrodata was realigning toward commercial markets.

Astrodata is paring operating expenses in order to increase margins, a company spokesman said, but the company does not expect its effect to show in the fourth quarter.

Yunker described an electronic data sorter which the company expects to become "a very successful computer peripheral."

Yunker also ascribed lower sales volume to new products that hadn't become available as soon as expected.

Greyhound Computer Report Shows Revenue Jumping but Net Stumbling

CHICAGO – Chicago-based Greyhound Computer Corp. has reported increased fourth-quarter and annual revenues for 1969, but lower net income than in comparable prior year periods.

Preliminary 1969 figures, subject to final audit, reflect revenues of $49.7 million and profits of $4.6 million. Last year's revenues were $38.6 million and net income was $5.4 million.

Net income per share declined to $1.05 in 1969 from $1.29 in 1968 on average outstanding shares of 4.3 million shares in 1969 compared to 4.2 million in 1968.

For the fourth quarter 1969, revenues and net income respectively were $12.5 million and $901,000, or 20 cents a share, compared to $11.2 million and $1.4 million, or 32 cents a share for 1968.

Ryal R. Poppa, GCC president, attributed the decline in net income "primarily to substantially higher interest costs during 1969, especially in the second half." He said more than 75% of the company's borrowings are tied directly to the prime rate, "which has been at an all-time high since June of 1968." Start-up costs in data services also were cited as a contributing factor in the decline.

Greyhound Computer Corp. is 74% owned by Greyhound Leasing & Financial Corp., a subsidiary of The Greyhound Corp.

Sales Rise, Profits Fall At Leasco Data Processing

NEW YORK – Net income of Leasco Data Processing Equipment Co. dropped 24% for the first quarter on a revenue increase of 15%.

Leasco attributed the decline to Reliance Insurance Co.'s sagging investment portfolio. Reliance, a Leasco subsidiary, took only $2.9 million in net realized gains for the quarter as opposed to $5.9 million in 1968.

The figures for the last quarter ended Dec. 31 were net income of $10.1 million, equivalent to 62 cents a share, on total revenue of $130 million, as opposed to income of $13.2 million, or 82 cents a share, on revenues of $113 million in 1968.

Net income from insurance operations also declined to $4.4 million from $4.8 million, but computer, consulting, and leasing income rose 14% from $2.5 million to $2.9 million.

Revenues from computer operations also climbed by 44%, from $19.9 million to $28.6 million, while insurance revenue rose to $101.4 million from $93.5 million.

At the Leasco annual shareholder meeting, held three days before the release of the figures, Saul Steinberg, chairman and chief executive officer, repeatedly refused to divulge first quarter results.

Steinberg would only say that revenue increased and that he was optimistic about the company's "total picture." He also said that Leasco was seeking a major role in the computer services industry, for which he foresaw a 26% annual growth rate.

The December quarter earnings reflect fully consolidated results from Reliance's life insurance subsidiaries, and the 1968 figures were restated to reflect this and the acquisition of companies on a pooling-of-interest basis.

The annual meeting was marked by repeated questions by shareholders to Steinberg on quarter results. At one time he replied to a shareholder "I think we said about 12 times that we are very optimistic about the total picture. But I believe we should report the quarterly figures when they are ready."

Estimates of 90 Cents Per Share Confirmed by Computest President

NEW YORK – Computest Corporation has confirmed a security analyst's estimate of earnings of approximately $840,000, equal to 90 cents per common share, on estimated sales of $11,500,000 for the year ending May 31, 1970.

This would compare with earnings of $493,000, or 53 cents per share, on sales of $7,700,000 reported in 1969.

The new estimate reflects a revision upward in anticipated 1970 growth compared with anticipated progress reported at the company's annual meeting last October, according to Richard I. Endres, Computest president.

Endres conformed to a meeting of analysts that an important focus of the company's current research and development program was the creation of test equipment for integrated circuit memory systems.

Computest, with headquarters in Cherry Hill, New Jersey, manufactures computer memory test equipment.

MiniReview IV:

Reliable Systems A Key To Hewlett-Packard Success

By Michael Merritt
CW Staff Writer

Long before Hewlett-Packard began making minicomputers it was a leading manufacturer of electronic instruments. The move into data processing wasn't a long journey into unknown territory for H-P; it was more like a trip to the corner drug store. A profitable one, though. H-P's minicomputer sales have been growing about 600% per year.

Its first entry was the 2116A in 1966. A 1.6 μsec memory cycle machine, the 2116A is in nearly 100 installations around the world. The 2116A was replaced in September, 1968, by the 2116B, a machine with similar characteristics but better engineering.

Hardware

The 2116B is a 16 bit word machine with a basic memory of 8,192 words expandable to 16, 24, or 32K. Typical add time is 3.2 μsec and the basic instruction repertoire totals 70. Basic price of the 2116B is $25,000.

H-P also offers the 2114A and B, 2 μsec machines with memory from 4K to 8K. The difference between the A and B is that the B offers direct memory access, high speed I/O, and multipriority interrupt, while the A does not. The 2114B in minimal configuration sells for $8,500, while the A is somewhat less.

The 2114s and the 2116B have the same instruction repertoire, and are program compatible.

The Whole Computer

While the minis themselves have a high reputation — one programmer called the 2116B "a honey" — the interesting thing H-P is doing with them is packaging application systems.

For example, the 2000A is a 16 terminal time-sharing system based on the 2116B, selling for $90,000 with one heavy duty teletypewriter unit, but without the 16 terminals. The 2005A is a real-time multiprogramming system using the 2116B with 16K memory, and sells for $74,100. The 2007A is an educational computing system using pencil-marked cards and a 2114B, and its cost is $21,400, well within the budget range of most schools.

These applications packages,

including hardware, software, interfacing, and instruction, demonstrate a major advantage of minicomputers. Because their price is low, their sales volume is high, and a purchaser has the advantage of the experience of many other users who have debugged the system. A purchaser with no experience at all in data processing can buy, at reasonable cost, a system he can plug in, turn on, and forget about.

One-Third OEM

While about one-third of H-P's minis go to original equipment manufacturers, another third are used in time-sharing installations through, primarily, the 2000A package. Though far behind in dollar value, H-P has the second largest number of time-sharing installations, just behind GE.

The remaining third of H-P's minis are used in a mix of scientific, business, and educational installations, apparently letting OEM take care of process control applications.

H-P makes about 50% of its peripherals, in particular magnetic tape drives, card readers, and optical readers, and contracts out line printers, high speed punches, disk drives, and mass memories. The line of peripherals is comprehensive, though, particularly in instrumentation, where the rest of Hewlett-Packard's technical divisions are significant.

H-P says that it has installed 1,500 minis since it began their production in 1966, and plant facilities are now over 200,000-sq-ft for computer manufacturing with another 125,000-sq-ft for peripherals. Though it is difficult to break out R&D figures since the company has a centralized advanced research center, the mini facilities themselves employ 150 hardware engineers and 80 systems programmers. R&D expenditure, of course, is a crucial indicator of the future performance of any company involved in a technical field.

In time-sharing, H-P's manager of marketing said that his company has no competition, due to its early entry into the field. Competitors for OEM business are Digital Equipment Corp and Data General; for data communication, Interdata and Varian; and for instrumentation and scientific applications, Systems Engineering, DEC, and Varian.

Hewlett-Packard is strong in all the significant areas of minicomputer competition. With a highly respected hardware base, good software, strong financial backing, and the systems marketing approach that generates volume business and more profitable non-OEM sales. When the shakeout comes in minicomputers, H-P should well come out near the top.

Next time: Varian.

Earnings   Reports

COMPUTER MICROGRAPHICS INC.
Year Ended Aug. 31

	1969	1968
aShr End (Loss)	($b.05)	$.13
Revenue	993,627	631,794
Earnings (Loss)	(37,210)	75,641

a-Based on 731,900 and 624,395 shares outstanding for 1969 and 1968, respectively.

NORTON SIMON INC.
Three Months Ended Dec. 31

	1969	1968
Shr End	$.69	$.58
Revenue	258,475,000	236,266,000
Earnings	9,096,000	7,539,000
6 Mo Shr	1.36	1.14
Revenue	516,835,000	480,276,000
Earnings	17,702,000	15,227,000

HONEYWELL INC.
Year Ended Dec. 31

	1969	1968
Shr End	$4.15	$3.41
Rev	1,426,000,000	1,201,300,000
Earnings	62,500,000	50,500,000
3 Mo Shr	1.50	1.35
Rev	416,200,000	368,200,000
Earnings	22,700,000	20,000,000

DATA DOCUMENTS INC.
Three Months Ended Dec. 31

	1969	1968
Shr End	$.45	$.40
Revenue	5,890,795	5,059,521
Earnings	212,874	202,095

a-1969 figures are unaudited.

COMPUTER COMMUNICATIONS
Six Months Ended Dec. 31

	1969	a1968
Shr End	$.21	. . . .
Revenue	4,595,845	$2,633,116
Earnings	251,006	b81,756

a-Restated to reflect acquisitions on a pooling-of-interests basis; b-Loss.

RECOGNITION EQUIPMENT INC.
Year Ended Oct. 31

	1969	1968
aShr End	$.23	. . . .
Revenue	35,707,455	$13,535,733
Spec Cred	b2,572,442	. . . .
Earnings	c3,712,023	d2,404,463

a-Based on income before special credit; b-Income tax benefit from operating loss carryforward; c-Equal to 74 cents a share; d-Loss.
On a fully diluted basis, earnings per share in 1969, before special credit were 22 cents, and 73 cents after special credit.

HEWLETT-PACKARD CO.
Year Ended Dec. 31

	a1969	1968
Shr End	$2.02	$1.66
Revenue	323,780,000	288,349,000
Earnings	25,585,000	20,825,000

a-Final report.

TEXAS INSTRUMENTS INC.
Year Ended Dec. 31

	a1969	1968
Shr End	$3.06	$2.41
Revenue	831,822,000	671,230,000
Earnings	33,511,000	26,324,000
3 Mo Shr	.85	.69
Revenue	227,000,000	180,253,000
Earnings	10,400,000	7,542,000

a-Preliminary.

BRADFORD COMPUTER & SYSTEMS
Year Ended Dec. 31

	1969	a1968
Shr End	b$.39	$.004
Revenue	4,570,000	905,000
Earnings	537,000	5,139

a-Period of commencement of operations; b-Adjusted for stock options and a common stock purchase warrant.

BARNES CORP.
Six Months Ended Dec. 31

	1969	1968
Shr End	$.30	$.21
Revenue	2,200,691	1,465,154
Earnings	149,558	104,177

AUTOMATIC DATA PROCESSING
Six Months Ended Dec. 31

	1969	a1968
Shr End	$.28	$b.20
Revenue	16,815,471	12,273,421
Earnings	1,385,131	9b8,003

a-Restated to include acquisitions on a pooling-of-interests basis; b-Adjusted for a three-for-one stock split in November 1969.

DATATRON PROCESSING INC.
Year Ended Oct. 31

	1969	1968
Shr End	$.18	$.09
Revenue	6,752,815	3,909,902
Earnings	944,742	488,015

EDP RESOURCES INC.
Six Months Ended Dec. 31

	1969	1968
Shr End	$.22	$.37
Revenue	5,236,000	1,364,000
Earnings	168,000	178,000

SENSITRON INC.
Three Months Ended Nov. 30

	1969	1968
Shr End	$.02	. . . .
Revenue	345,435	$76,708
Earnings	17,784	d10,525

a-Loss.

WRONG NUMBER
Last week *Computerworld* incorrectly reported Honeywell computer and communications earnings as $35 million. The proper figure is $351 million.

Nickels and Dimes

$ Our bug in the executive washroom at RCA overheard plans for "capturing 9% of the DP systems market by the end of 1970. The hopes revolve round a new fourth-generation machine.

$ The new marketing manager at Viatron has the duty of pushing sales and soft-pedalling rentals – after Viatron just got $25 million in new financing. User reaction to the System/21 has been delight from those who have gotten deliveries and disgust from those who haven't been able to get their peripherals, particularly printing robots and tape cartridges. Which may be why Viatron needs cash so badly.

$ Telecor turned in its first public report; earnings were $595,922, up from $461,254 for the first quarter a year ago, on sales of $13 million, up from $11 million.

$ Communitype, key-to-tape maker, is reorganizing and refinancing. Cash flow worries caught up with them last year, so Hybrid Systems, a subsidiary of Scientific Resources, will be doing the manufacturing for them, and Sanford Computer and Computer Data Applications will do the selling. Communitype plant will be used for R&D.

$ Nine cents a share were the first quarter earnings of Evanshan Computer, up from five cents a year ago. Total earnings were $170,000, up from $71,000, and revenues jumped to $1,395,000 from $522,000. Computer leasing portfolio climbed 61% to $23.5 million. William Brennahan, president, said he saw only moderate growth in leasing, but had higher hopes for software and process control systems.

$ Data Network on the acquisition trail again, this time buying up Logistic Distro Data and its LDD Computer Services subsidiary for an undisclosed amount of stock. Logistic is a New York service bureau. The acquisition is apparently another step in Data Network's plan to become a nationwide information utility.

$ First-half results at Adage: bigger sales, bigger losses. Volume was up to $2 million from $1.7 million for the year earlier period, but losses increased to $185,000 from $132,000. Adage predicts losses for the rest of the year as well.
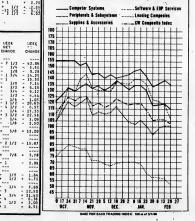
$ And Informatics reports third quarter revenues up to $5 million but a third quarter loss up to $32,000. Last year it made a profit in the quarter of $86,000 on sales of $2.75 million. For the nine months, revenues have almost doubled to $14 million but an operating loss of $202,000 has replaced a profit of $316,000. Removing $1.5 million of "good will" from the balance sheet brought the per share loss for the nine months to $1.13. The company ascribes the loss "entirely. . . to California data center operations. Although we have initiated an effective cost reduction program. . . . our goal is to achieve breakeven. . . in the date centers by the second quarter of fiscal 1971."

Computerworld Stock Trading Summary

NEW YORK AND AMERICAN STOCK EXCHANGE CLOSING PRICES, FRIDAY, FEBRUARY 20; OVER THE COUNTER, THURSDAY, FEBRUARY 19

SUPPLIES & ACCESSORIES

EXCH	'69-'70 RANGE	CLOSING PRICE	WEEK NET CHANGE	WEEK % CHANGE
O	67- 51	59	----	----
N	22- 11	12 5/8	- 1/4	- 1.94
O	27- 15	16 1/2	+ 1/2	+ 3.12
O	29- 13	15 3/8	+ 1/2	+ 3.33
O	44- 26	31 1/2	- 2 1/2	- 7.35
N	19- 15	17 1/2	+ 5/8	+ 3.70
O	173- 65	125 3/8	+ 4 1/2	+ 3.46
N	118- 94	108	----	----
O	39- 24	35 1/2	+ 1 1/2	+ 4.22
N	49- 36	41 3/4	----	----
O	48- 30	45 3/4	+ 1/2	+ 1.21
O	31- 23	30	----	----
A	38- 29	37 1/4	+ 2 1/4	+ 6.42
O	30- 10	24 1/8	- 1/2	- 1.26
O	40- 28	39	- 1/2	- 15.72

ACME VISIBLE
ADAMS-MILLIS CORP
BALTIMORE BUS FORM
BARRY WRIGHT
DATA DOCUMENTS
ENNIS BUS. FORMS
MEMOREX
3M COMPANY
MOORE BUS FORMS
NASHUA CORP.
REYNOLDS & REYNOLD
STANDARD REGISTER
UARCO
WABASH MAGNETICS
WALLACE BUS FORMS

PERIPHERALS & SUBSYSTEMS

EXCH	'69-'70 RANGE	CLOSING PRICE	WEEK NET CHANGE	WEEK % CHANGE
N	85- 43	44 1/2	- 6 5/8	- 12.96
O	71- 10	13	- 1/4	- 5.45
N	49- 32	39 3/8	- 1 3/4	- 6.26
N	36- 10	11 1/4	+ 1/2	+ 4.65
O	19- 8	9 3/4	- 1/4	- 2.63
O	17- 9	15 3/8	+ 5/8	+ 4.03
O	37- 18	31	----	----
O	38- 11	11 3/4	+ 2 5/8	+ 9.25
O	28- 8	10 1/2	----	----
N	48- 27	28 1/2	- 1/4	- 2.33
O	16- 7	8 7/8	+ 1 1/2	+ 5.56
O	27- 12	20 1/8	+ 5/8	+ 3.01
O	15- 15	21	----	----
O	23- 12	12 1/2	- 1/2	- 3.72
N	53- 31	35 5/8	- 1 3/8	- 5.72
O	18- 5	6 3/4	- 1/4	- 3.57
O	37- 13	13 1/2	- 1/2	- 3.57
O	32- 10	17 1/2	- 1/2	- 1.52
O	82- 13	17 1/2	- 1 1/4	- 10.38
A	17- 8	63 7/8	- 1/2	- 10.66
A	89- 59	77 1/4	- 3/8	- 0.40
O	118- 40	41	----	----
N	31- 10	11 5/8	+ 1/8	+ 1.00
O	15- 3	4 1/8	+ 3/8	+ 10.00
A	46- 23	37 1/4	+ 1 7/8	+ 5.30
N	42- 17	17 1/2	----	----
O	37- 5	5	- 1/2	- 5.61
O	75- 25	52 3/4	+ 1 1/8	+ 2.16
N	61- 18	18 5/8	- 1 1/2	- 7.45
O	85- 28	38	----	----
O	36- 15	20	- 1/4	- 2.50
N	159- 20	121 5/8	-13 7/8	- 10.61
O	58- 14	39	+ 1/2	+ 1.37

ADDRESSOGRAPH-MULT
ALPHANUMERIC
AMPEX CORP
ASTRODATA
BOLT, BERANEK & NEW
BUNKER-RAMO
CALCOMP
COGNITRONICS
COLORADO INST.
COMPUTER COMMUN.
COMPUTER EQUIPMENT
DATA PRODUCTS CORP
DATA TECHNOLOGY
DIGITRONICS
ELECTRONIC M & M
FABRI-TEK
FARRINGTON INT.
INFORMATION DIS
MARSHALL INDUSTRIES
MILGO ELECTRONICS
MOHAWK DATA SCI.
OPTICAL SCANNING
PHOTON
PHOTO-MAGNETIC SYS.
POTTER INSTRUMENT
PRECISION INST.
RECOGNITION EQUIP
REDCOR CORP.
SANDERS ASSOCIATES
SCAN DATA
TALLY CORP.
TELEX
VIATRON

SOFTWARE & EDP SERVICES

EXCH	'69-'70 RANGE	CLOSING PRICE	WEEK NET CHANGE	WEEK % CHANGE
O	14- 4	5 1/2	----	----
A	32- 9	10	----	----
O	19- 5	4 1/4	- 7 1/2	- 42.86
O	47- 34	45 1/4	- 3/4	- 5.56
O	16- 7	10 1/2	- 1/2	- 0.28
O	17- 5	5 1/2	- 1 3/4	- 14.29
O	21- 1	5/8	----	- 15.38
N	21- 6	8 5/8	- 1/8	- 7.14
O	16- 6	11 1/2	+ 1/2	+ 6.15
O	47- 10	10 3/4	- 3/4	- 6.12
N	34- 10	24 1/8	+ 1/8	+ 4.44
O	28- 9	10	- 1 1/4	- 1.02
O	35- 5	5 7/8	- 1 1/2	- 20.65
O	9- 1	5/8	----	----
O	26- 13	15 8	- 1/4	- 1.54
O	30- 17	22 3/4	- 1/4	- 1.08
O	24- 3	4 3/4	+ 3/4	+ 18.75
O	17- 6	6 1/2	----	----
O	13- 3	4 1/2	+ 3/8	+ 12.00
O	26- 9	10 3/4	----	----
O	38- 7	9 1/8	----	----
O	30- 12	13 1/4	- 2 1/2	- 15.87
O	37- 14	----	----	----
O	21- 3	5	----	----
O	26- 13	15 8	+ 7/8	+ 3.70
O	43- 23	46 3/4	----	----
O	23- 12	23 1/2	- 2.09	
O	11- 3	4 1/2	----	----
O	37- 11	30	- 1/2	- 1.64
O	35- 10	11 1/8	+ 3/8	+ 4.71
O	10- 1	2	----	----
O	12- 3	5	- 1/4	- 7.69
O	36- 11	21	----	----
O	12- 3	4 1/4	+ 3/4	+ 21.43
O	155- 55	58 7/8	+ 5/8	+ 1.08
O	18- 6	22 1/4	+ 1/2	+ 2.00
O	16- 6	12 3/4	+ 1	+ 8.51

ADVANCED COMP TECH
APPLIED DATA RES.
ARIES
AUTOMATIC DATA PRC
AUTO SCIENCES
BRANDON APPL SYS
COMPUTER AGE INDUS.
COMPUTER APPL.
COMPUTER ENVIRON
COMPUTER NETWORK
COMPUTER SCIENCES
COMPUTER USAGE
COMPUTING & SOFT
CONSOL, ANAL, CENT.
DATA AUTOMATION
DATA PACKAGING
DATAWATION SERVICE
DATATAD
DIOITEK
EDP RESOURCES
ELECT CORP PROG
INTERMETRICS
ITEL
LEVIN-TOWNSEND SERV.
MANAGEMENT DATA
NAT CORP ANALYSTS
PLANNING RESEARCH
PROGRAMMING METHODS
PROGRAMMING & SYS
PROGRAMMING SCIENCES
SCIENTIFIC RESOURCES
SOFTWARE SYSTEMS
STRATEGIC SYS
TRS COMP COUT INC.
UNITED DATA CENTER
UNIVERSITY COMP.
URS SYSTEMS
U.S. TIME-SHARING

COMPUTER SYSTEMS

EXCH	'69-'70 RANGE	CLOSING PRICE	WEEK NET CHANGE	WEEK % CHANGE
N	172-120	152 1/4	+ 2 1/4	+ 1.46
N	69- 22	23 5/8	- 3/8	- 1.61
N	159- 58	59 7/8	- 0 3/8	- 9.62
N	124- 54	119 3/4	- 2 1/2	- 2.05
N	25- 7	8 1/8	+ 1/8	+ 1.56
A	28- 10	12 1/4	+ 1/4	+ 2.08
N	45- 25	53 7/8	----	- 2.17
N	98- 67	68 5/8	- 1/4	- 0.36
N	114- 75	97 1/4	+ 4	- 3.95
N	207- 57	138 1/4	+ 3 3/8	+ 2.79
N	387-293	349 1/2	+ 1/2	+ 0.14
N	171-100	147 3/8	+ 3/4	+ 0.51
N	48- 29	30 1/4	- 1/8	- 0.43
N	50- 26	27	----	+ 1.26
N	45- 1	6	+ 3/4	+ 3.70
O	55- 33	34 1/2	- 5 5/8	- 14.29
A	53- 26	40 3/4	- 2 1/2	- 5.74
N	57- 22	27 3/4	+ 1 7/8	+ 7.25
A	61- 36	45 3/8	+ 2 3/8	+ 5.52
N	115- 85	98 5/8	+ 7/8	+ 0.90

BURROUGHS CORP
COLLINS RADIO
CONTROL DATA CORP
DIGITAL EQUIPMENT
ELECTRONIC ASSOC.
ELECTRONIC ENGINEER.
FOXBORO
GENERAL ELECTRIC
HEWLETT-PACKARD CO
HONEYWELL INC
IBM
NCR
RCA
RAYTHEON CO
SCI. CONTROL CORP.
SPERRY RAND
SYSTEMS ENG. LABS
VARIAN ASSOCIATES
WANG LABS.
XEROX CORP

LEASING COMPANIES

EXCH	'69-'70 RANGE	CLOSING PRICE	WEEK NET CHANGE	WEEK % CHANGE
O	14- 0	7 1/8	+ 1/4	+ 3.64
O	45- 20	21 1/8	+ 5/8	+ 1.61
O	18- 4	6 1/2	- 2 1/2	- 27.78
O	34- 10	11 1/4	- 1/2	- 4.26
O	15- 7	12 1/4	- 5/8	- 5.77
O	60- 21	22 1/4	- 5/8	- 2.73
O	16- 2	7	- 1/2	- 3.45
A	52- 19	21 1/2	- 2	- 3.45
O	16- 7	7 1/4	+ 1/2	+ 6.45
A	45- 14	15 3/4	+ 3/8	+ 3.33
O	28- 11	13	+ 1 3/8	+ 11.83
N	54- 16	17 3/8	+ 2 1/8	+ 10.90
O	9- 4	4 1/4	----	- 2.56
A	57- 9	11 1/8	----	----
O	8- 1	---	----	----
O	14- 2	3	----	----
O	12- 6	7 1/4	+ 1/4	+ 4.00
O	34- 3	5 3/4	+ 5/8	+ 9.43
A	28- 11	16 5/8	+ 1/4	+ 4.17

BANISTER CONTIN
BOOTHE COMPUTER
COMPUTER EXCHANGE
COMPUTER LEASING
CYBER-TRONICS
DATA PROC, F & G
DATRONIC RENTAL
DEARBORN COMPUTER
DPA, INC.
GRANITE MGT
GREYHOUND COMPUTER
LEASCO DATA PROC.
LECTRO COMP LEAS
LEVIN-TOWNSEND CORP
LYC DATA, INC.
MANAGEMENT ASSIST
NCC LEASING
SYSTEM CAPITAL
U.S. LEASING

Computer Stocks Trading Index

— Computer Systems   ⸺ Software & EDP Services
— Peripherals & Subsystems   ⸺ Leasing Companies
— Supplies & Accessories   ⸺ CW Composite Index

OCT.   NOV.   DEC.   JAN.   FEB

BASE FOR EACH TRADING INDEX: 100 as of 3/1/68